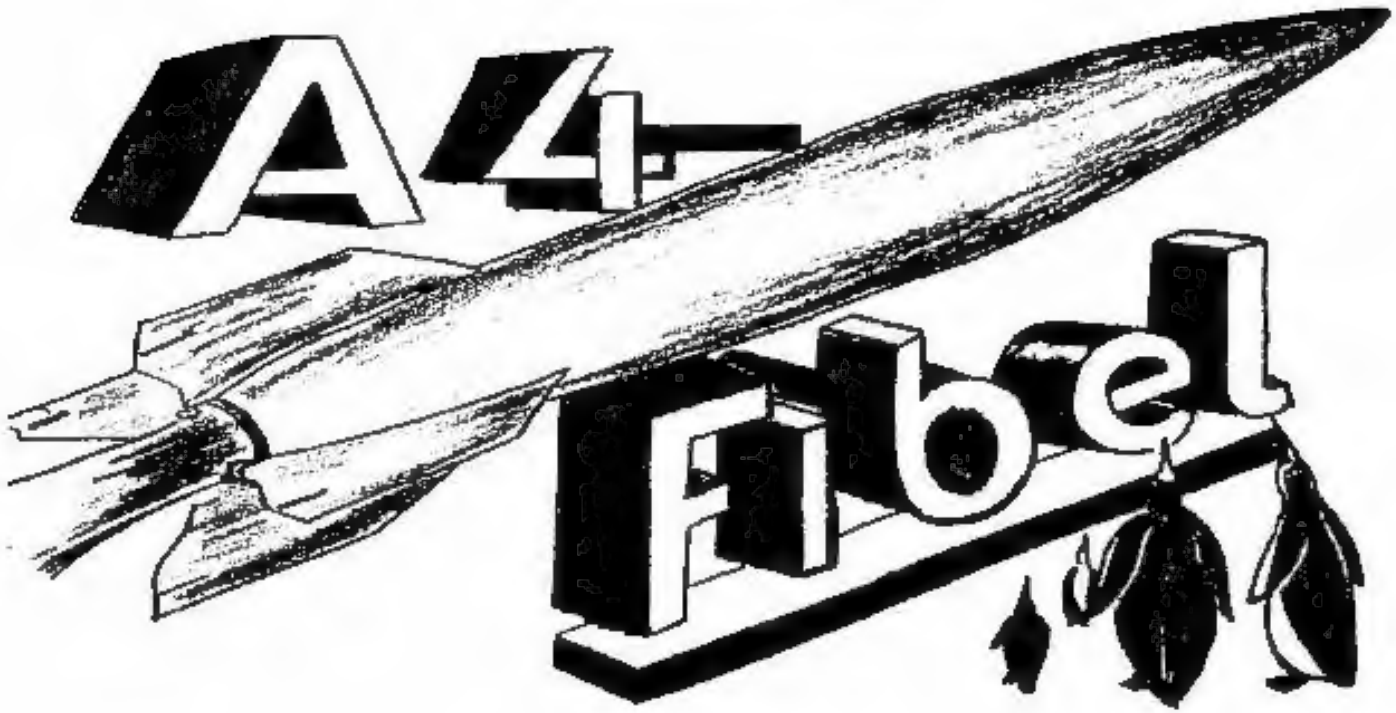
ENGLISH TRANSLATION



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ARMY BALLISTIC MISSILE AGENCY

Redstone Arsenal, Alabama

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Introduction

A German A - 4, commonly called the V - 2, took flight on April 16, 1946 from White Sands making it the first truly modern rocket to be launched from the United States.

Wernher von Braun and a team of German scientists had developed the rocket and now manned the technology alongside their American colleagues.

Through their labours came the development of such important projects as the Redstone and Jupiter rockets and the first and only U.S. vehicle to bring men to the moon and back, the Saturn V.

It was 50 years ago that this historical start was undertaken, making the start of the American Missile and Space program.

To commorate this historical event we have published a reprint of the American A - 4 manual. Like the original manual issued in 1957 by the Redstone Arsenal, it is printed in English with the original German illustrations.

TABLE OF CONTENTS

	Page
Everbody Listen	3
You're a Member of the Long Range Rocket Crew..	4
Faster than Sound	5
50 Word Technique from A-4	6
In the Firing Position	13
The Measuring Troop	14
Preparing a Position	15
The Men from the Carrier	21
Driving Butwith Sense	22
Erection	24
Returning Faulty Equipment	34
The Power Unit Man	36
The Connection	37
Power Unit Test	43
Fueling	46
Ignition System	53
The Electrician Crew	55
The Current	58
The Controls	59
The Pilots of the A-4	60
Preparations Prior to Launching	62
Frequency doubler and Combustion Cutoff	65
The J-Device	72
Guide Beam Instalation	76
Guide Beam Controling Appatatus	80
The Firing Supervision	83
The Vehicles	84
Installation of the Cable	85
The Power Supply Trailer	87
Inside the Launch Control Car	88
The Nose Piece of the Fuse	102
The Fuel Dump	103
The Fuel	104
The Fueling Operation	107
In the Remote Control Position	121
Combustion cutoff Ground Instalation	122
The Transmitter Truck	125
The Cut-off Evaluation Truck	135
The Guide Beam Ground Installation	144
The Change in Frequency	148

FOREWORD

This translation of the A4 Fibel (Primer) presents the German version of a technical manual for the V-2 missile, an operator's guide which bridged the gap between technical laboratory reports and the field soldier who used the equipment. The illustrated approach, with points vitalized by cartoons, might be considered a basic interpretation of highly technical matter for the benefit of the an on the firing line.

A wide gulf lies, and will always lie, between the research and development laboratory and the field soldier who is called upon to use the completed and standardized esult of that laboratory's research. Field manuals and technical manuals, almost without exception, are dry and uninteresing in their methods of presentation, and the soldier who seeks simplicity finds himself bogged down in a mass of unnecessary detail and technical jargon which have been written with the assumption that the man in the field is throughly familiar with the methods and techniques reported.

Those who have undertaken the translation and reprinting of the A4 Fibel have felt that the German originators at least approached the solution of the problem of the overly complex manual and that those who read it might recognize the need for directness and simplicity in the preparation of similar documents which might be used by persons whose education is not that of the technical laborarory.

This reprint of the A4 Primer preserves the page.for.page format of the original text. The editing procedure adopted was to assemble, translate, and present the data in as identical

as the primary sources would allow. Since the A4 handbook was issued under Peenemünde security regulation, the initial German publication of 150 copies was restricted to field troops. Inumerable conflicting line-lengths were expected and were encountered but the problem was solved by use of an 8 X 10-1/2 page instead of the smaller pocket size of the original. Considerable effort has been made to achieve accuracy and completeness in translation; accuracy in the sense of avoiding technical errors and completeness by including details of the original edition, including all illustrations, arrangement, and reproduction of the cover page. It should be remembered that the significance of the jingle-mottos frequently depends upon German idiom which unfortunately is lost in translation.

It is felt this A4 Fibel will prove of value as reference for the general researcher who seeks background information about the state of the art, as well as those who desire to be informed on project or program history as presented by Peenemünde Research Institute. The A4 Fibel was translated by Sp Ted Woerner, Prdnance Corps; editorial supervision was under the direction of John A. Bitzer; publication was by the Reports and Publications Section, Development Operations Division, Army Ballistic Missile Agency, Redstone Arsenal, Alabama.

-: JOHN A. BITZER

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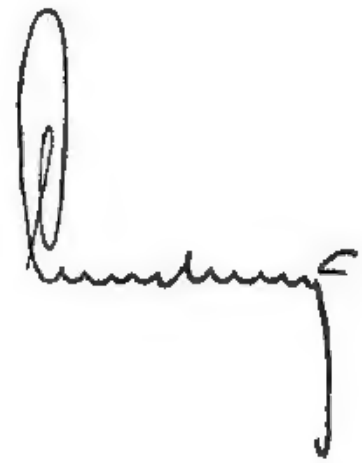
O.U., 4 August 1944

I authorize the A4-Fibel



Everybody listen up!

You, dear reader, find here
the new Fibel for the A4.
The boring stuff, with premeditation
in a easy form presented,
makes it more pleasant for you,
it should be evident and convenient
to go into you flesh and blood
if it did not happened yet.
So far everything is good and beautiful,
but, please, one cannot be overlooked:

The whole stuff about the A4 is top secret, just remember this!

Who speaks about it, perpetrates treason,
it hurts you and the state!
Just remember one thing,
Do not take part in any debate!
Make yourself not smarter then you are,
because it is not of your own knowledge.
Stay away from discussions
you only get in trouble!
And you get ask by an outsider
an informer or a smart ass,
then just go into full retreat,
Otherwise you could loose your head!
Put on your stupidest face and say:
"My name is rabbit, I do not know nothing!"

You live on this earth planet
at the age of long distance rockets.
The sky-ship in space -
A work of peace and a human dream -
Greeted the new century!
Now it means to master a new weapon:
As a secret equipment still unknown,
here known as A4 apparatus.

You belong to the FR - Force,

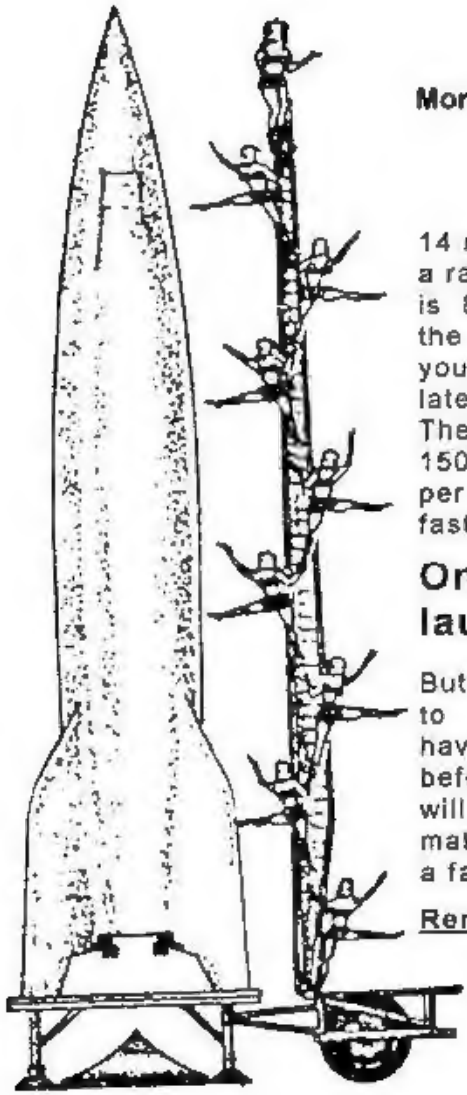
which operates the A4 long distance rocket. You are also involved with the projectile, which is larger and flies further then all other known projectiles.

The A4's powerful blast effect, cannot up to now be matched by any other known projectile or bomb.

At the launch preparations you are working hand in hand with your comrades. It lays in your hands, to quickly prepare the A4 for launching and for reaching the target.

The projectile maintenance is part off it. Use your free time.

Only with a well planned maintenance program of all the equipment and tools, could a safe preparation for the next launch be guaranteed.



Moral: To be perfect is not easy
take care of every little detail it will lead to perfection

Faster then the speed of sound

14 m long is the A4, it weights 12.5 t and it reaches a range of 300 km. The speed when it hits the surface is 800 m per second. The A4 also flies faster then the speed of sound. You cannot here the arrival; you only hear a gigantic explosion, but then it is too late. The top speed of the A4 is reached 1 m after launch. The speed is double as when it hits the target, around 1500 m per second, this is about 5400 km per hour, which is about 8 times faster then the fastest airplane.

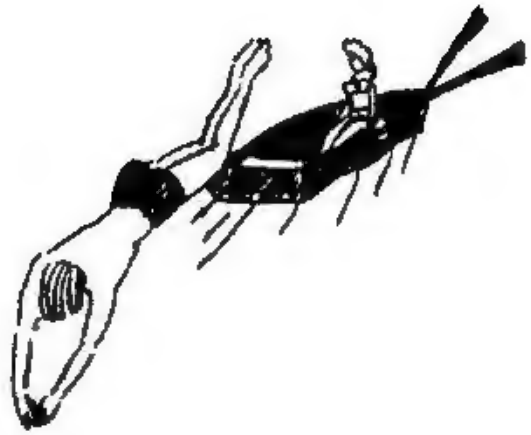
Only 5 minutes passes between launch and hitting the target.

But in the 5 minutes everything has to work. All parts of the A4 have to be checked and repaired before a launch, so that shot will hit the target. Only a small matter could be the reason for a failure..

Remember: Every launch failure helps the enemy
hurts us through the loss of valuable materials,
and also endangers you and your comrades.

Moral: The rocket takes it badly
if you do not look into the fibel.
But it gives the enemy trouble
after every successful shot

MOTTO: You will save yourself
much trouble in life,
if you always know
what you should know.



50 WORDS OF TECHNIQUE IN REGARD TO THE A-4

Jet Propulsion:
man jumps into a river from the stern of a boat. The boat will move forward. This is caused by the backward pressure. The same principle is used for the propulsion of the A-4.

The combustion unit is installed at the rear. High pressure combustion gases flow from it and drive the A-4 forward.

The Thrust is the force produced by propulsion.

The gases of combustion are formed by burning two liquids called A and B substance. More than 8000 liters of both substances are needed for filling up the A-4. They will burn up in one minute.

A-Substance aids combustion. It is unbelievably cold (183 degrees). You have to be real careful in handling it, or you will suffer freezer burns. Wear at least asbestos gloves. A-Substance is inflammable.

B-Substance is the fuel that burns up. It is explosive and poiseneus if used internally. A-Substance and B-Substance are fed to the combustion unit separately.

Jets spray the two propellants In the head of the combust on unit you will f nd many hundred jets. These jets should not be dirty otherwise they will cause failure at launching

The Pressure in the Combustion Unit s 15 atu This is necessaty in order to facilitate a fast exit of the gases of combust on from the combustion unit

A-Substance and B-Substance Pumps Against a pressure of 15 atu, A and B Substance has to be pumped nto the Combustion unit Therefore we need two rotary pumps one A-Substance pump (1) and one B-Substance pump (2)

One Steam Turbine (3) drives the two rotary pumps It is located between the pump

At the turbine-driven auxiliary the steam turbine and the two pumps are comb ned

One steam generating plant is utilized to chemical y generate steam for the turbine Here steam must be generated within a fraction of a second

The Steam Generator generates steam by mixing two substances, T-Substance and Z Substance together

The T-Substance generates over heated steam T Substance affects the skin like an acid and inflames clothing Wear protective clothing

Z-Substance acts as a decomposing agent

The Steam Pressure amounts to approximately 32 atu T-Substance and Z Substance must be fed nto the steam generator under this pressure

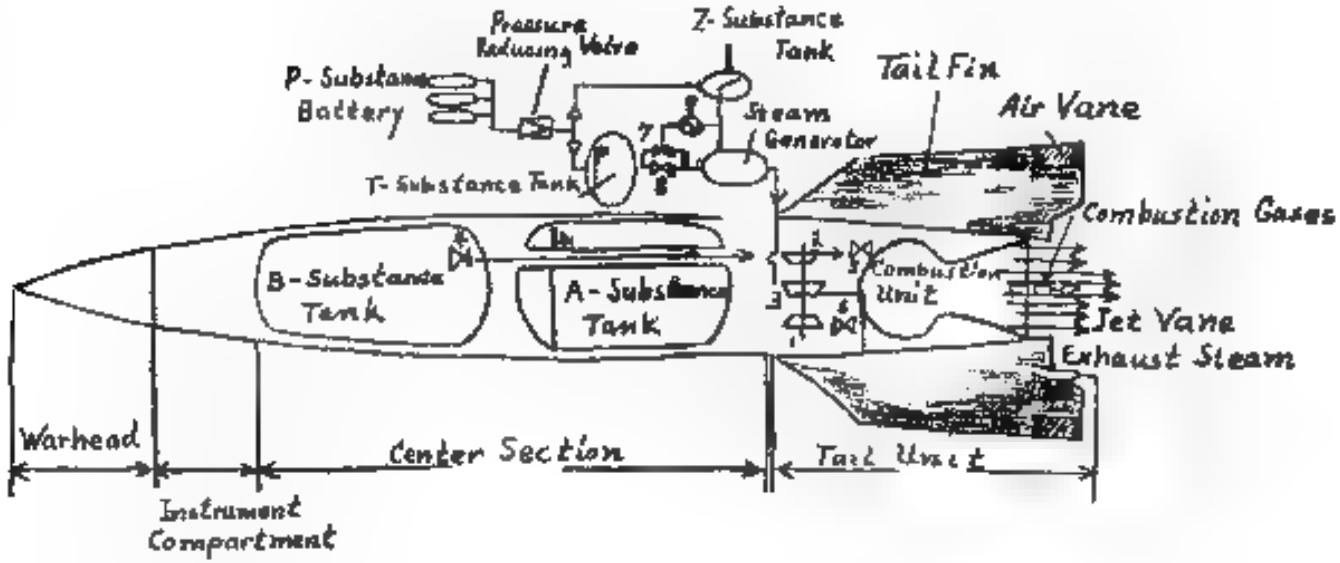
P Substance (compressed air or nitrogen, is carried in the A.4 in pressure-bottles of below 200 atu

The Pressure Reducer Here the pressure of the P-Substance (200atu) is reduced to approximately 32 atu The steam reducer has to be adjusted perfect y according to the pressure read ngs on the shipping document

The B-Substance Pilot Valve (4) is located at the bottom of the B-Substance tank, it shuts off the drain line

The B-Substance Main Valve (5) is installed in the head of the combust on unit It regulates the B-Sub stance flow to the spray jets

View of the total Instrument Apparatus.



The A-Substance Main Valve (6) is located at the pressure nozzle of the A-Substance pump It blocks the A Substance supply to the spray jets of the combustion units

The T-Substance Valves T-Substance will flow through the 8-ton pressure valve (7) and the 25-ton valve (8) to the steam generator in such a quantity that the produced thrust of the A-4 will amount to approximately 8 tons, or as the case may be 25 tons

A Pressure Contact (9) causes the valves (7) and (8) to open only then when a little of the Z-Substance has a ready entered the steam generator Otherwise an explosion could occur when T-Substance and Z-Substance meet

The Main Parts of the A-4 are the warhead the nstrument compartment the middle part, and tail unit Instrument compartment, middle part and tail unit are made accessible through shutters

The Shutter Diagram will show you where the ndv dual shutters are located

The war head contains the explosive

Instrument compartment with Sections and IV carries batteries steering equipment and radio equipment

The Middle Part contains mainly the A-Substance storage tank and the B Substance storage tank

The Tail Unit contains the Thrust Unit. (The drive)

The Four Fins located on the tail unit prevents the A-4 from turning over during flight They are numbered 1 to 4

The Thrust Unit consits mainly of a combustion unit, a turbogenerator and steam generator It converts the energy of fuel into push power (or thrust)

On the FR-Carrier the A-4 will be mounted horizontally and is transported into the firing

position in that way. It is erected by utilizing a crane-device and is erected on a launching platform in a vertical position

The Fueling — with A-Substance, B-Substance, T-Substance Z-Substance and with P-Substance will be done when the device is erected

Steering — Then fired the A-4 will take off vertically Through installed automatic control it is held on the prescribed course and is steered in such a way that upon termination of propulsion the missile will be at a certain angle to the horizontal

The Rudders — The A-4 is steered by the rudders Four jet rudders are located in the stream of the gases emerging at the tail unit and four air-rudders operate at the outer edge of the Tail-fin

Propulsion. — As long as combustion gases flow from the A-4 the missile will be driven forward As speed increases during propulsion

Cut Off. — Approximately one minute after firing the fuel supply of the combustion unit will be cut off After that the A-4 will fly like a normal shell that has left the gun barrel Two methods may be employed for cut off

1 Cut off from radio signal given from the ground

2 Cut off via the installed impulse device in the missile itself.

The Range. — The firing is regulated by an earlier or later cut-Off of the fuel supply Propulsion is therefore cut off at a lower or higher velocity. The angle of take-off is always

the same

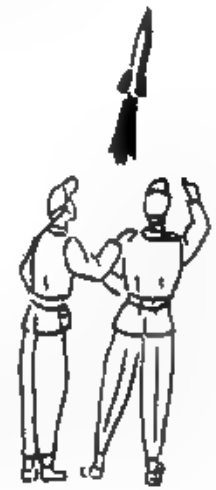
The Direction. The direction in wh ch the missile w ll fly is regulated by the turning of the launching platform The steering operates in such a way that the A-4 flies in the direction of f n Number 1

Due to the Localizer Beam Method the deflection dispersion may be reduced by radio

Electric Batter.es. wh ch are aboard, supply the A 4 with the necessary power while flying

The Launching Site. The A-4 is launched from the launching site

The Ground Device. In conclus.on the A-4 must be adjusted and tested. For this and for launching the ground installation is utilized, consisting of various types of equipment



The Power Supply Trailer supp l es the electric ty necessary for test.ng the A-4

The Compressor Unit s available for producing the necessary compressed air (P Substance)

The Launch Conntrol Car has panels installed through which the preparatery and firing process may be tested.

The Combustion Cut-Off Site harbours the apparatus utilized for disconnecting the driving mechanism v a radio This equ pment is located 0 to 14 k.lometers, usually 7 to 9 km behind the firing site

The Guide Beam Transmitter is set up approximately 10 to 16 km behind the launching site The Gu debeam transmitter afords a more accurate lateral guidance of the A-4

The X-Time Chart governs synchronization and f ow of the ndiv dual work processes You will ocate t in the append x The X-time chart gives you enough time to complete your work satisfactor ly You will f gure the time backwards At X-100 it w l be 100 minutes to launching

MORAL A theory is a much hated th ng and yet, nothing can be accomplished without it

THE SHUTTER PLAN

(1) Hatch for A-Substance and T-Substance filling

(2) Hatch for Z filling

(3) Hatch for pressure reducing valve

/4) Hatch for Z-B eeder

(5) Hatch for pressure content and T-draining valve

(6) Hatch for Z-dra ning valve

(7) Hatch for secondary distributor

(8) Hatch for turning the pumps and removal of safety regulator cut-out

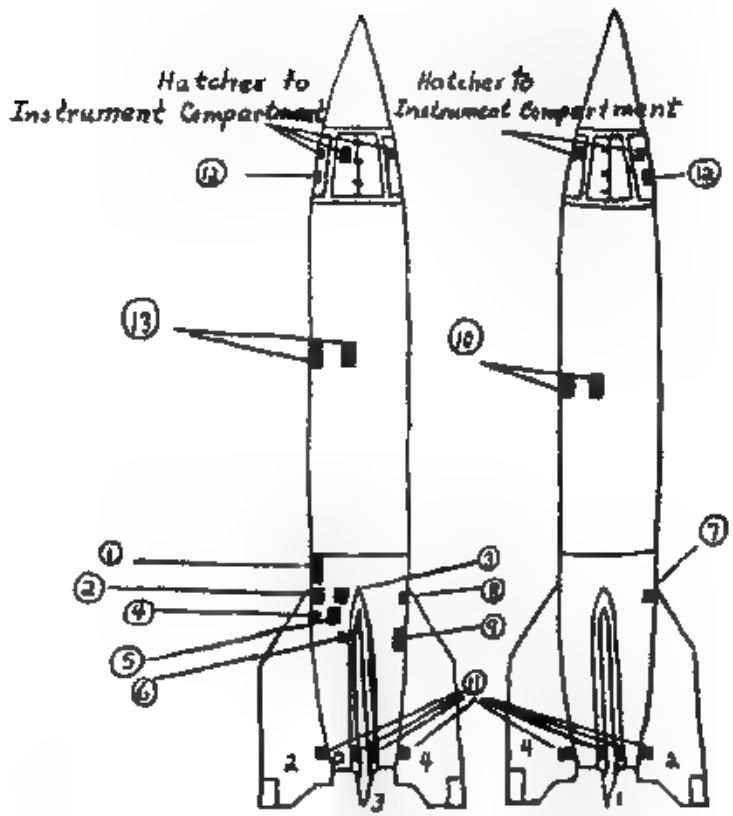
(9) Manhole

(10) Loading hatch

(11) Serve hatch unit

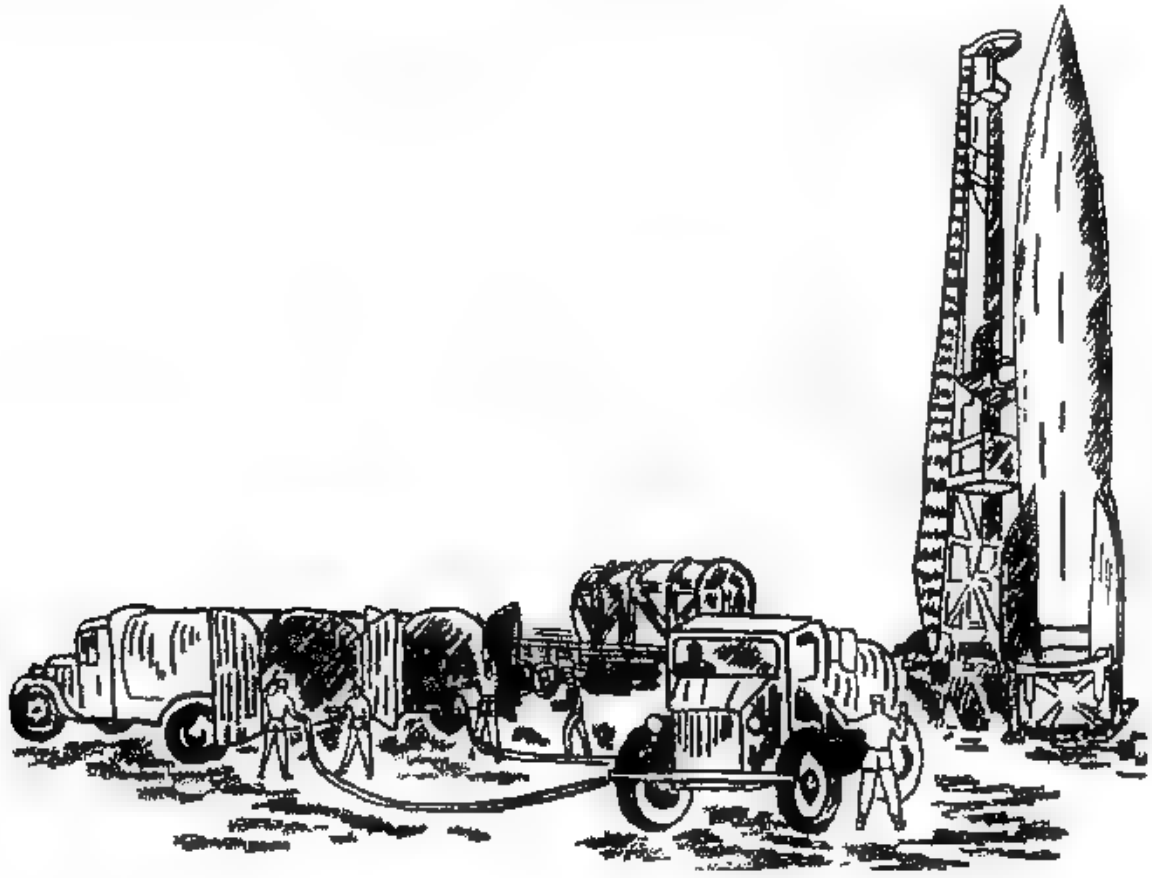
(12) Spring hatch for magnetic plugs

(13) Ventilation hatch



IN THE FIRING POSITION

At the f ring site the A-4 placed into a vertica position, it is raised for aunching, tested fueled and then finally launched Most of your work is done at the launching site



THE MEASURING TROOP

The rifle man has it relat vely s mple he sees the target that he wants to hit. But you will shoot at a target that cannot be seen In order to determine distance and d rection certain measurements and ca culat ons are necessary This work has already been done so that you will be in possession of the results once you move into the firing pos.tion

AIMING IS YOUR PRIMARY JOB

You will therefore perform surveying and adjustment jobs Accuracy on your part will determine the accuracy of fire

MOTTO:

TITLE. PREPARING THE POSITION

He who does everything the way it should be done
must be a living magician.

Your friend has offered you his summer home to live in, due to the fact that your apartment was damaged. You intend to furnish the house with your furniture. In order to save time and prevent confusion you must first measure the furniture and the rooms of the house. The some holds true for the A-4. Here the launching site had also been surveyed prior to your moving in. All the important data is given in the launching site manual.

After your detachment has moved into the launching site, locate the measured points. In order to be sure that they are still correct you must check and re-adjust them. For it is possible that a measured point has been moved or removed maliciously. In such a case you must restore the point.

This work must be completed prior to moving the A-4 into firing position.

Otherwise -- it cannot be moved into the correct position.

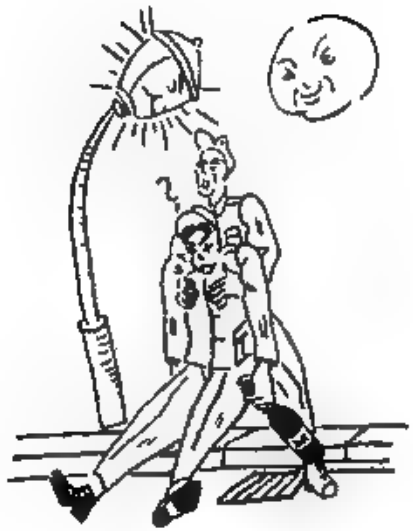
After the A-4 has been erected you will make adjustments, that is:

1. Turn it in a vertical position,

Otherwise -- the Electro Detachment will not be able to get the steering mechanism ready for firing.

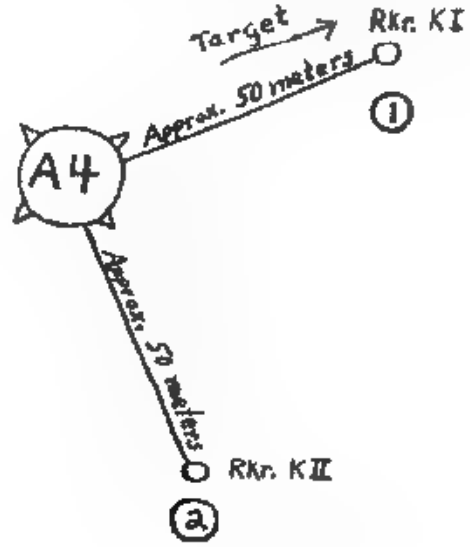
2. Fin 1 must be turned in the direction of fire,

Otherwise -- it will fly in the wrong direction.



PLACING THE MISSILE IN A VERTICAL POSITION

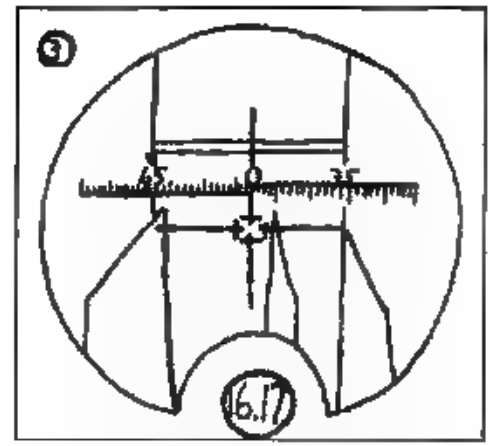
For placing the missile in a vertical position two aiming-circle collimaters of 12m are necessary, of which however, you only need the grid plate of the telescopic sight An aiming-circle collimater is an optical device with which it is possible to lay two optical axis reciprocally and this more accurate than with an aiming-circle



(1) If possible set up an aiming-circle collimater 12m (Rkr K) in the direction of fire, approximately 50 meters in front or behind the A-4 and level it

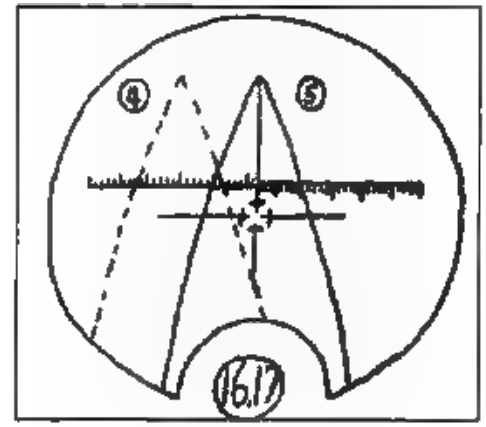
(2) Do the same with the second circle aiming collimater (Rkr K) and this vertically if possible

(3) Adjust the telescopic sight of the first aiming-circle collimater at any azimuth reading, by turning the outer part of the ircle toward the A-4 in such a way that its left and right edge above the fins on the gr d plate are spaced equally from the center of the cross hairs



(4) Tilt the telescopic sight by turning the elevating gear until the nose of the A-4 moves into your sight

(5) Direct the men of the trailer-crew until, by adjusting the spindles at the launching platform, the center line in the telescopic sight is covered by the nose of the A-4 Do the same from the second aiming-circle collimater (Rkr Kl) Repeat the process from Rkr Kl and II.



PREPARING THE POSITION TO THE AZIMUTH OF THE TARGET

When preparing the position to the azimuth of the target you must set Fin 1 of the A-4 exactly in the direction of fire It is assumed that the launching site has been surveyed.

There are two surveying points that are especially important

1 A point directly in the launching site for which the final azimuth of the target and the distance to the target has been calculated

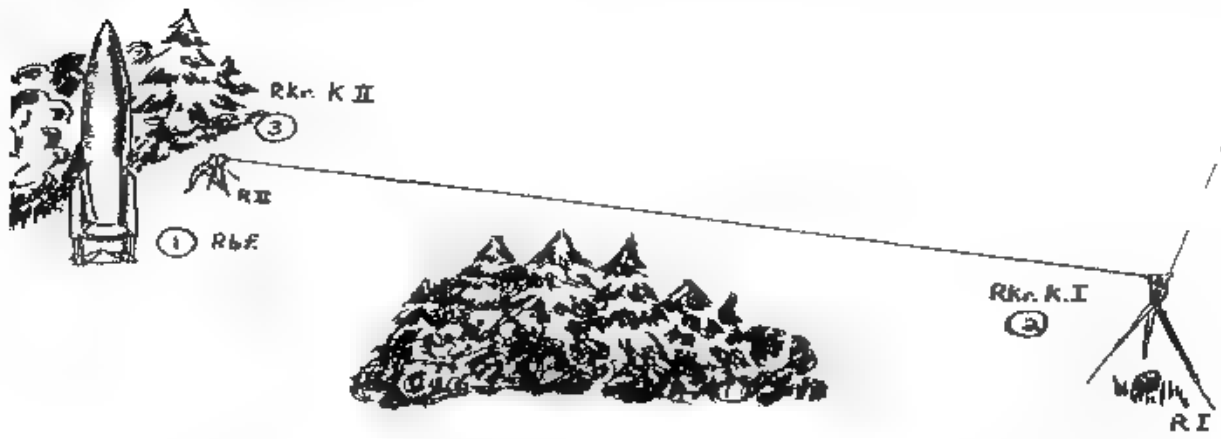
2 Close to the launching site the aiming point R hatter has been chosen in such a way that the control points and possibly the launching sites can be observed

The launching site manual contains information on the position of the points as well as the azimuth of the target and the control points

Rkr K II In order to make adjustments the following is required.

2 aiming-circle collimaters 12 meters and one dial sight with collimater grid-plate and one frame

(1) Install the panoramic telescope (Rbf) with frame in control axis No 1 2 and 4 Clamp the movable arm of the frame



(2) Place an aiming-circle collimator 12m (Rkr K II), not to exceed a distance of 12m from the K-4 on an arbitrary point---designated as R II--- from wh ch the Rbf on the A-4 and the Rkr K I is visible.

If such a point R II cannot be found then place an additional aiming-circle collimator between R I and R II so that both can be observed

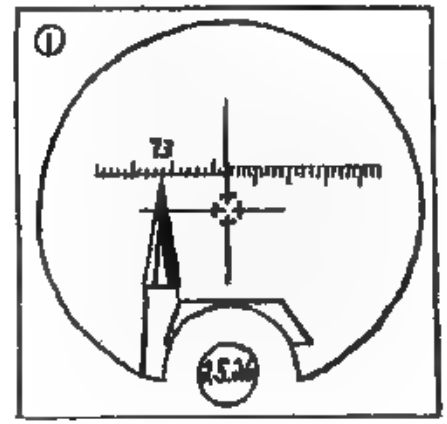
Remember. The Rbf must remain visible from R II even when turning the A-4 in the direction of fire

Your Job on the aiming-circle collimator I

(1) By utiliz ng Rkr K I sight the requested aiming point --- for example the church in A-town-- by utilizing a requested number--in this case for excample 2573

(2) Turn the upper part of Rkr K I on point R II by depressing the plunger notch and let it lock. Read-off the excact number - for excample 4829 5. Relay th s number to your comrad at the R II

Your job on the aiming-circle collimator II



Obtain a bearing from Rkr K II to point R I by utilizing the given number New Rkr K II and K I are parallel

Turn the upper part of the Rkr K II, by depressing the plunger notch until the Rbf on the A-4 is visible on the picture screen

Latch into the next notch You wil call out the aximuth reading to your comrade at the Rbf--always the number on the right side of the found sector--as a hundred number, for excample 3800

Adjust the collimator periscope on the Rkr K II in such a way that the collimator signal plate is illuminated as much as possible. Should it be dark then attach an electric light

Your Job on the Dial Sight

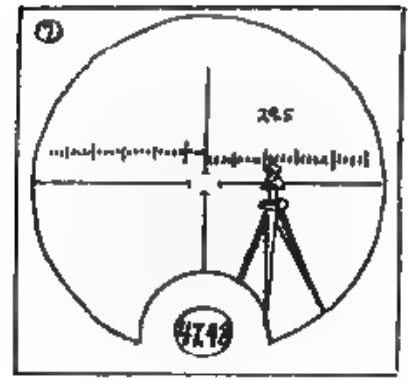
Read off the angle of dev ation supplied with a plus or minus sign and indicated on air-rudder No 4

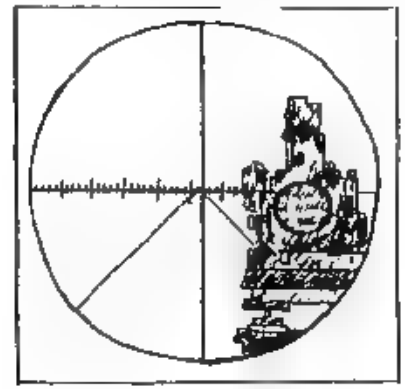
Add the reading to the given azimuth read ng 3800 if the sign is + and subtract if the sign is -

Utilizing this number make the adjustment on the dial sight.

D'rect the men of the trailer-crew at the ratchets of the launching platform in such a way that they will turn the A-4 on the turret ring until the collimator signs which you w ll observe in the collimater by utilizing the dial sight are situated above the same signs you see in the dial sight For adjusting the f eld of vision utilize the graduation on the head of the panoramic telescope

The A-4 is therefore parallel with the a ming circle coll mator and po nts in the direction of the target





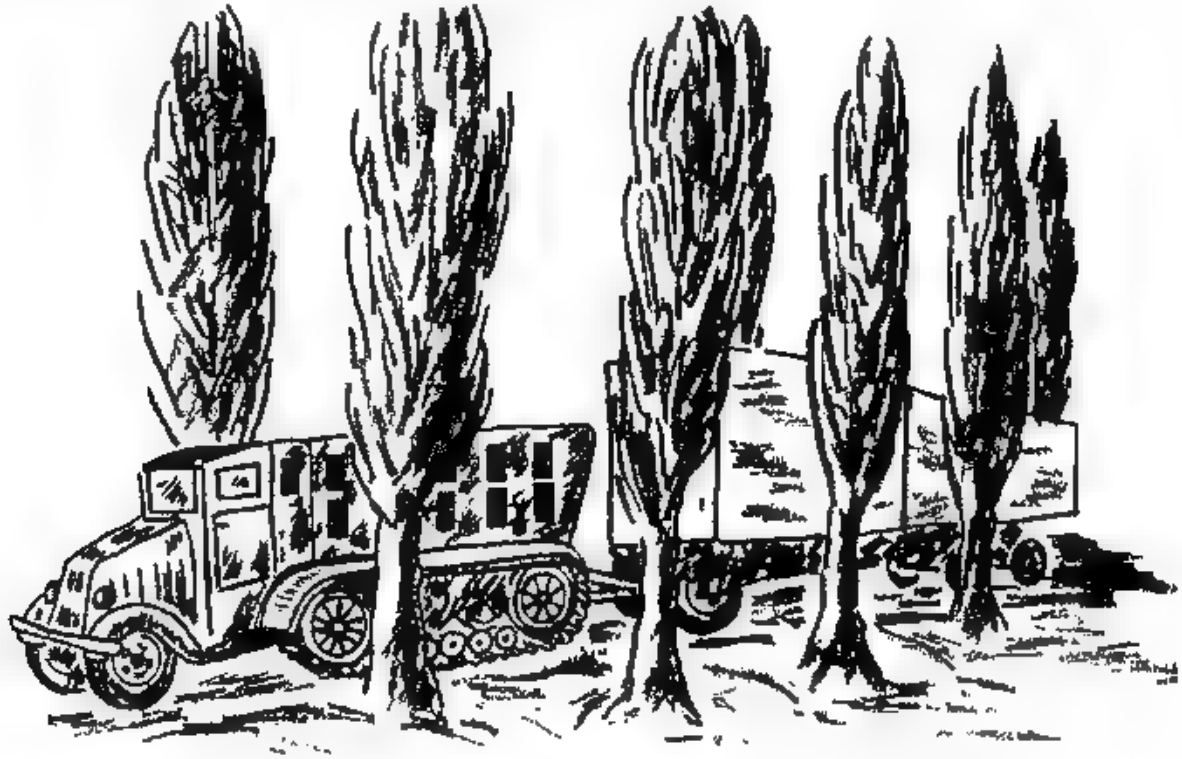
MORAL.

Only then when the A-4 is in a vertical position and when the missile has been turned in such a way that Fin No 1 points towards the enemy w il the missile be sure to reach its destination

THE TRA LER CREW

You will transport the A-4 from the field depot to the launching site over roads and narrow farmways through narrow curves and low underpasses

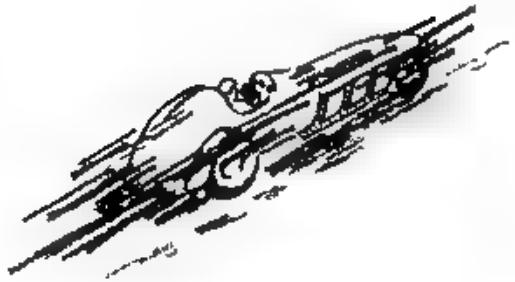
It is up to you whether the missile is delivered without defect or whether it will be damaged through transport If you damage it you don't have to deliver it. Just take it right back to the field depot.



With 80 or 100 km an hour

MOTTO. You make no speed with the A-4

DR.VING, BUT WITH SENSE



Caracc.ola drove over the Avus at a speed of 200 km an hour
When going into the curve of the Nurburgring he had to drive slower But he was driving a racing car and not an A-4

Like an egg the many sensitive parts of the A-4 are covered by a shell

Therefore - you must handle the A-4 in much the same way you handle the egg you bring home when on furlough

Drive slowly, and carefully and if possible on good roads

Otherw se--screws will oosen and protruding parts such as Fins w. bend and the propu.sion unit crew will waste valuable time with repais

Good Roads Drive w th a speed not over 40 kilometers per hour

For Cross Country and Field Paths Drive according to the circumstances

Curves. Watch that the tires don't rub against the frame
Otherwise--the tires will be damaged and the outrigger axles warped!
Sma est half curve radius is 10 7 meters
In the toghter curves you can turn the rear axles separatly
The hand turnig devoce should be attached for this

Underpasses. Must be 4 meters high, if you drive with the camoflage frame they must be 4 20 m high

Otherwise---you will damage the fins!

Dust and Dampness are enemies of the A-4, for dust clogs the propellant jets in the combustion unit caus ng the miss e not to take off properly Dampness settles in the valves causing them to freeze up at the low temperature of the A-Substance

For protection the tai of the A-4 s covered w th a tarpaulin The oops must be t ed from top to bottom.

Watch that the loops and zippers of the tarpaulin are closed and that the tarpaul n is not damaged

Otherwise--your tr p will be useless!

Trees. Should you pass trees too closely the branches wi l tear holes in your camoflage tarpau n and damage the A-4 Remember your trailer s 2 87 meters wide

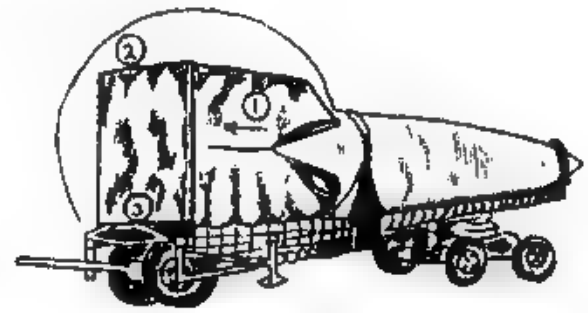
At The Launching Site.

park at the designated spot

Unhook your tractor and should

it not be needed any more then

park it in the close--imber posit on



Now Remove the Tail Tarpaulin!

Sequence of operation

(1) Open

(2) Ro l off

(3) Pull out

MORAL Where prudence and orethought are cvombined
The trip wil surely be a success

MOTTO

Momentum does not always accomplish
what constant persistence may

ERECTION OF THE A-4

To do a handstand in gymnastics requires a certain amount of momentum. A well-trained athlete applies the correct amount of momentum so that he will not fall

If you can't do it, you'll have somebody hold you up

The A-4 could not stand such a push Erection takes place very slowly by utilizing two hydraulic lifts with four telescoped pistons In spite of this you must make sure to stop erection at the proper amount so that the A 4 does not fall backward

For Erection You May Utilize the Rocket Carrier Only

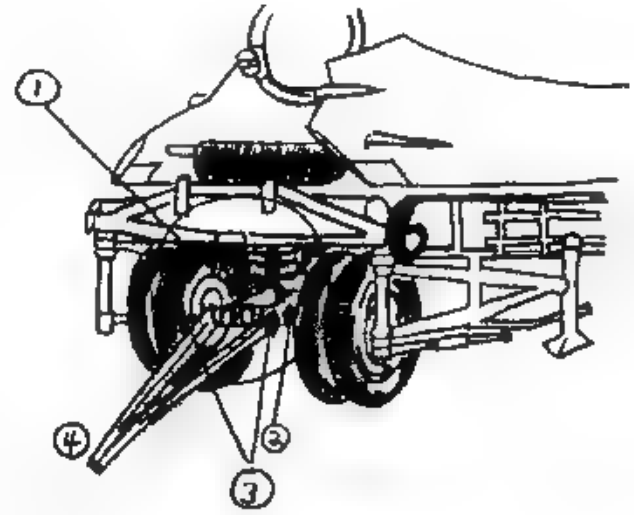
First you will have to remove the draw tongue and then relieve the front axle Only then may you pull up the launching platform from the front It serves as a footing for the erected A-4-

The A-4 is launched from an upright position

REMOVAL OF THE DRAW TONGUE

(1) First turn up the triangular shutter located at the front axle The steering of the front axle is now locked

If you fai. to do this,
the trailer will go sideways!



(2) Remove the air-brake hose and attach the dust covers

(3) Remove the lock of the draw tongue bolt and the plate lift up the fork in the front Now it is possible for you to pull out the draw tongue bolt

(4) Remove the fork -otherw se you w ll not be able to push the launching platform in front of the rocket carrier

Shou d you place the draw tongue on the ground then don t pinch the air brake hoses

REMOVING THE WEIGHT FROM THE FRONT AXLE

(1) Loosen the bolts and turn the support-struts to the front

(2) Fasten the struts on the carrier frame You may arr ve at the correct length of the struts by turning the coupling sockets

(3) Turn your tie-spindles on the supporting plate unti the inner doublex tires are free from the ground

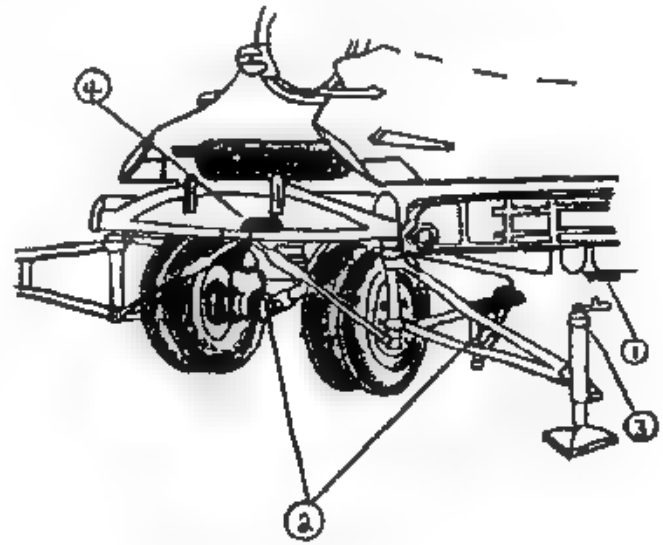
Otherwise- the front axle will not be sufficiently relieved of the weight

Be careful that you have the roght adjustment on the shift ever of the ratchet key

Otherwise--the ratchet wil turn n neutral

(4) Put your axle on the machined strip and see if the front axle is level

f you don't, the A-4 will never stand vertically



Remember! A ways raise the lower side of the veh cle, do not lower the higher side!

Otherwise -you will apply weight to the front axle again

The same ho ds true in Life
Always ra.se your standard, never lower t

ERECTING THE LAUNCHING PLATFORM

(1) Move up the launching platform The main support assembly on the torret ring should be pointed toward the rocket carrier

(2) The discs must be vert cally above the legs. The terminal screws must be tight

(3) Place the two be ts into the bracket stands at the torret ring and into the guides at the rocket carr er

(4) Unscrew the four foot plates of the launching platform

(5) Pull out the jack handle and lower the jack until the chute is clean

(6) Lowr the table by rais ng the four foot plates

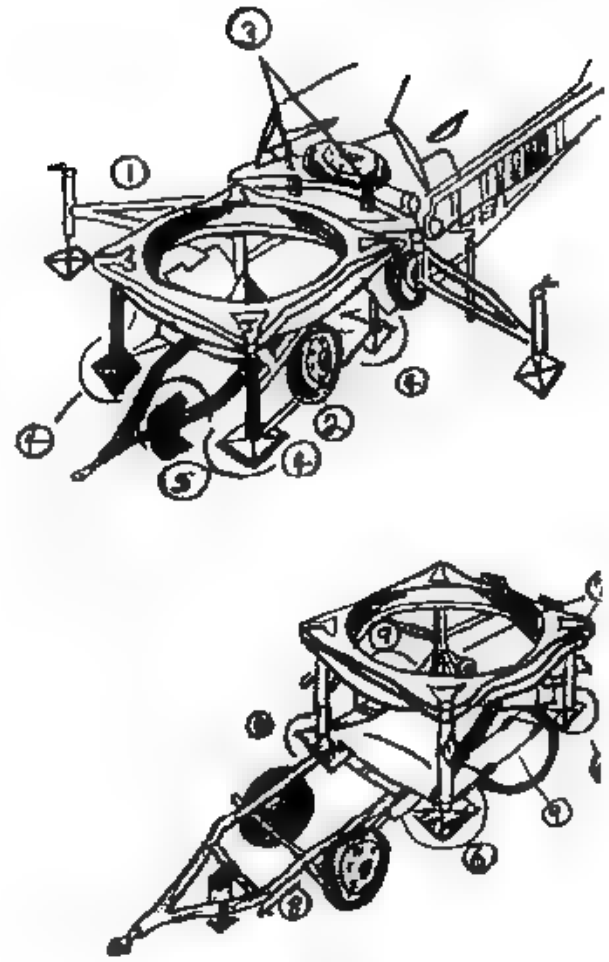
(7) Remove the two rear pins of the channels from the loop of the chute

(8) Pull out the chassis and set it off to the side

(9) nsert the wheel cut--out ratchet and place the launching platform into the lowest position

Otherw.se -Fin 1 and 2 will immediately bump against the discs should one unintentionally erect the missi e

Be sure that the weight s distr buted on all four foot plates



ERECTING THE A-4

Before Transferring the A-4 onto the rocket carrier.

Check the oil-level in the oil tank of the tilting mechanism

Before Erection.

Fasten the footbridges in the mountings of the tip frame.

Before Starting the Cold Meter.

(1) Turn cross handle "left" to end posit on

(2) Turn shut-pff valve "left" to end position

(3) Turn change over valve "left" to end position

The Erection

In order to erect the "bird"
you must have hydraulic oil
It is easily done with
atmospheric pressure
For erect on--the cross hand e
must be in the left hand end position

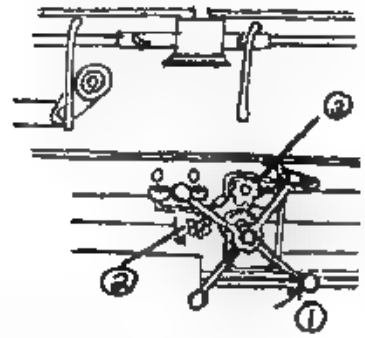
(1) Close the lock valve Caut on

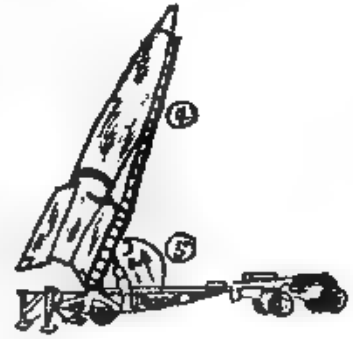
(2) Open sw tch valve As soon as the meter runs

(3) Turn your cross handle clockwise

(4) The tilt frame will then rise and the
bird will erect

(5) Watch pistons 1, 2, 3--it's important





(6) Now open the shut off valve

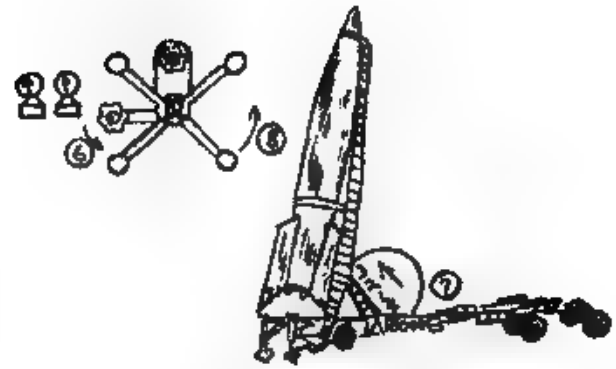
(7) The retraction piston can come up now

(8) Do this slowly turn the cross handle to the left

(9) Once the missile is in a vertical position you must turn the cross handle to the left end for stopping

(10) Close the shut off valve again You are through now

(11) The tilt frame is now straight



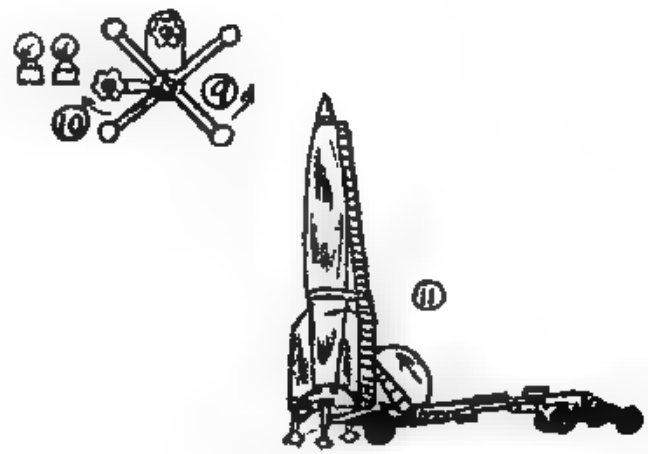
Note.

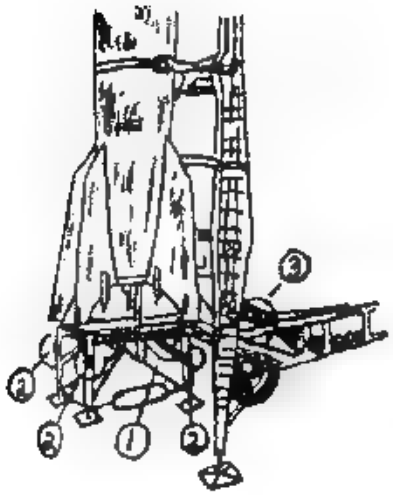
No one is allowed to be under the tip frame while erecting or lowering the missile

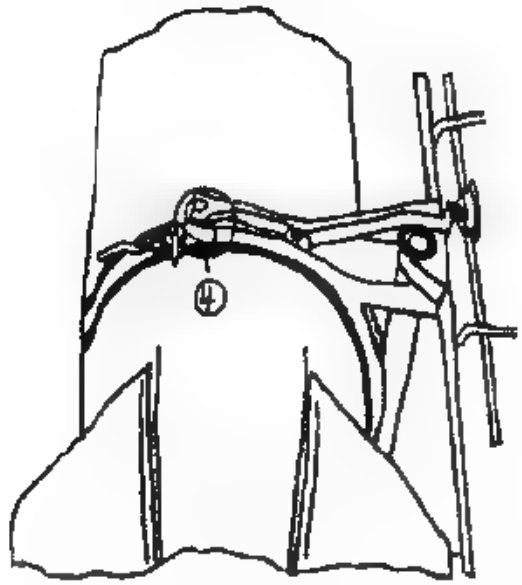
Check the correct adjustment of the central valve, should it not be possible to fully erect the tip frame

After erecting the missile raise the table until the turntable is about 10 mm below the lower edge of the pin

Check to see if the contact surface of the device rests properly on the discs of the launching platform and if the sockets at Fin No 4 are open for the radio lead-in cord







Remedy

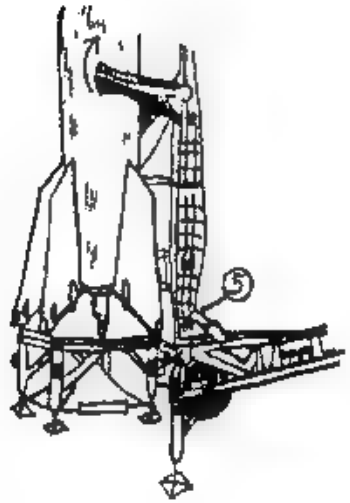
(1) Turn the turntable with the ratchets after loosening the assembling bolts at the mountings and removing the guides if necessary

If necessary move the entire launching platform

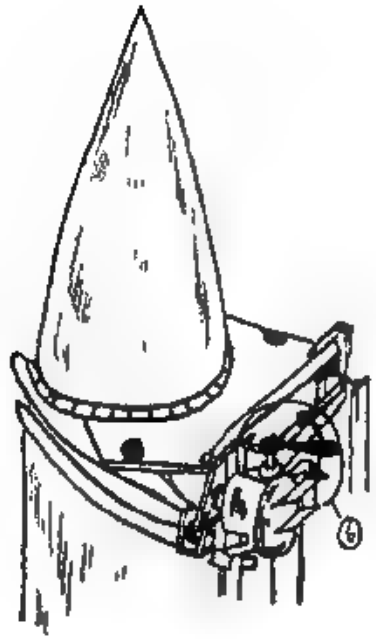
(2) Jack up the platform until it rests against the contact surface of the A 4 Lower the A 4

(3) A ratchet is connected to the short propeller shaft and turned until the resistance decreases and the strap bolts are relieved

(4) Open the strap from the footbridge and do not forget to remove the bracket joints from the connecting frame



(5) Remove the strap-belts from the connecting frame The ratchet is attached to the long shaft and turned until the strap bolts are removed from the connecting frame Observe this procedure from the foot-bridge



Should the A-4 be covered by a center tarpau n, the strap belt will not hold it any more and may be removed now

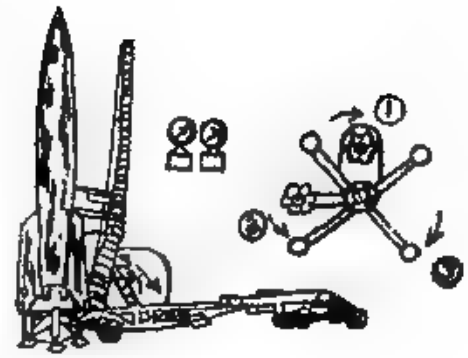
(6) Open the clamp A ratchet is attached to the square end of the worm gear and the c amp is opened Pay heed that the clamp does not touch the device

Otherwise--the t p-frame w rub against the dev ce when being lowered

Remedy. Lifting or lower ng the cantilevers of the rocket carrier

PUSHING BACK THE ROCKET CARR.ER 90 CM

Lower the tip frame approx mately 10 degrees until the A-4 stands c ear

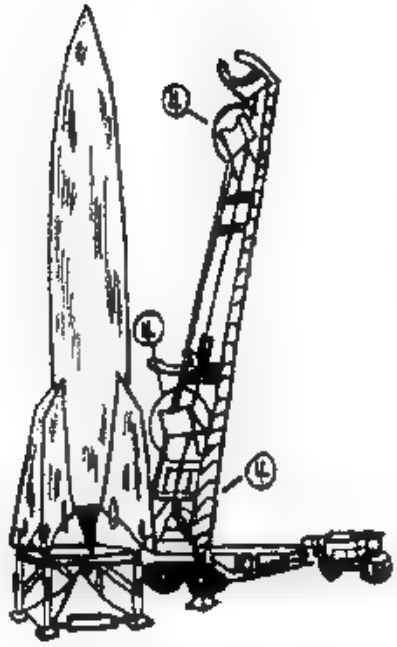


(1) Turn the change over-valve clockwise to "stop"

(2) Turn the shut-Off valve counter clockw se to the left
the tilt frame will lower itself

(3) After lowering up to approx matley 10 degrees turn the cross handle all the way clockwise

The tip frame will stop



Back up the support discs of the rocket carrier until they have cleared the ground

Otherwise--you w l not be able to push back the rocket carr.er which is necessary for erection of the p.atform

Push back the rocket carrier exactly 90 cm and pu.l the hand brake.

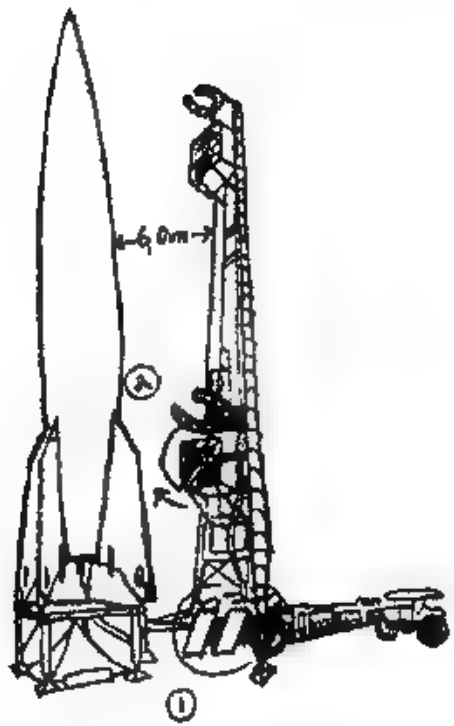
Give the A-4 a 90 degrees turn to the left Fin 2 and 3 will then point toward the rocket carrier

(4) Turn the cable winch and ower the working scaffold Relieve the front axle and level it by utilizing the water level

Erect the tip frame until the edge of the upper working scaffold is spaced approximately 10 cm from the instrument compartment The valve settings are the same

Shut off the meter

Erect the chain rail



After fuel ng the A-4, that is just prior to launching, push back the rocket carrier approx matley 6 meters The tip frame remains erected

At the same t me and according to the specifications given by the survey ng crew the A 4 is turned so that Fin No 1 will point in the direction of fire

Don t forget to tighten the four terminal screws located at the turn ng ring of the launching platform

(1) Place the guard-platform front of the tires of the front axle.

(2) Fo d up the power lines of the magnetic plugs

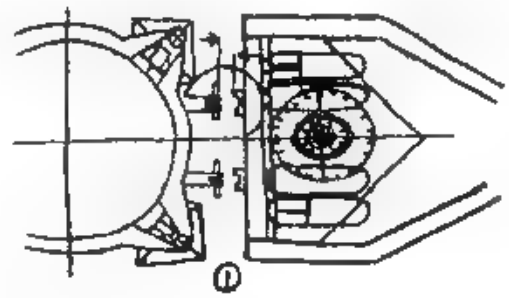
MORAL The t p-frame mechanism places the rocket in vertical position without any diff culty

Often, one must go to the trouble

MOTTO: of returning the unsuitable
RETURNING

Should a defect appear on the erected A-4 which cannot be done away with at the launching site, then the fuel must be removed from the A-4 and the A-4 itself be placed on the rocket carrier It is then transported to the field depot where the defect is removed

(1) Push the rocket carrier toward the launching platform to within a distance of 15 mm It is not necessary to insert the guides



Watch that the A-4 is turned in such a way so that the Fin No.3 and 4 point toward the rocket carrier The lowering mechanism must be wound to the top The main support assembly borders on the elevation angle located to the front and pointing in the direction of fire The sleeves clutch at the clamp and the clamp itself must be open. The rope grummet plugs are wound the outside. The working scaffolds are fastened to the tip-frame The upper part of the rope grummet is open Move the tip-frame into a vertical position

Slowly move into the final position and be careful not to drag the main support assembly or clamp on the side of the device when raising or lowering the crane of the rocket carrier

Climb up the ladder and close the clamp

You will raise or lower the launching platform by utilizing its four props until the rope grummet plugs and the connecting frame of the A-4 are even This may also be accomplished by raising and lowering the crane of the rocket carrier

Turn the rope grummet somewhat toward the A-4 Get up on the scaffold and see if the rope grummet pllugs can be inserted in the connecting frame

Otherwise--you will damage the connecting frame by forced insertion of the rope grummet plugs

Should the rope grummet plugs stick on the side, then turn the turning-ring of the launching platform

Turn the long driving shaft until the rope grummet plugs are inserted in the connecting frame

Hook the bracket joints into the connecting frame (2) Should the bracket be above or below the connecting frame then tap the lower part of the brace with a hammer

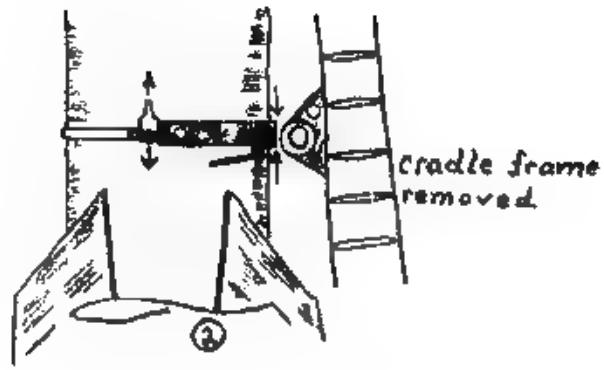
Lock the upper part of the brace by moving the tightening lever and insert the locking pin.

Lower the launching platform approximately 4 cm

Lower the tip frame into the horizontal position

Remove the working scaffoldings and fasten them together to the carrier frame.

Put on the tail tarpaulin



MORAL:

The things we don't like to do
must be done twice sometimes

A soccer player has to observe the other playing members of his group so that he will turn the ball over to them at the right time

Otherwise--victory will be questionable

As a driving mechanism engineer you will have to observe the work of the other sections so that you are able to start your work and end it in conjunction with the rs should the instruction chart require it

Otherwise--there will be unnecessary delays

Be sure that the door (1) of the box is facing out and the water t ght plug (2) is pointing down

Otherwise -the door won t open or the ground contro box wil be upside down

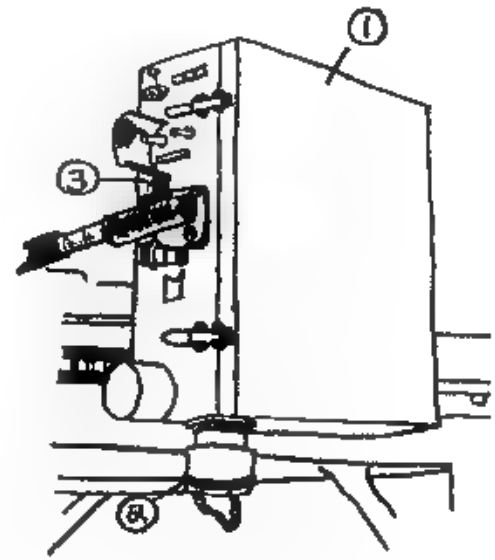
Be careful that the extension tubes don t protude from the ug eyes of the aunching p atform, or from those of the ground box

Otherwise--the soacing s wrong and the ground control box wi bump against the launching platform when turning the A-4-

Tighten the holding screws (3) on the plug eyes of the ground box

Otherwise--the ground control box may fal off

It is very important to correctly fasten
the box at the launching platform



Insta l the fivefold coupl ng as soon as the A 4 is on the launching platform Check to see if the rubber gaskets are serviceab e and flush your ines w th P Substance On the launching platform between Fin No 2 and 3 you w il f nd the socket for the f vefold coup ing Remember 2 3 and 5

Loosen lever (1) prior to plugging in the base of the coup ing device

Loosen lever (2) on the device so that you will be abie to push the coupl ng back and forth

Loosen the coup ing nut (3) at the un.versal joint of the counterpart so that the counterpart is turnable in every d rection

Turn hand wheel (4) to the eft (as seen from the top), so that you can tighten t up ater

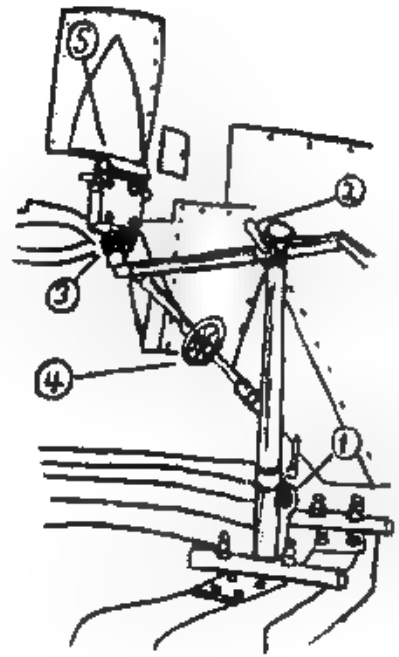
Pull back the protect ve cap (5) and fasten it with the locking pin

Put the counter part over the five pipe connections of the exhaust firing of the A 4

Don't force it

Otherwise--the rubber seals w ll be damaged

When insert ng the counter part be careful not to tilt it



Hold the joining l nkage together unt l coup ng knot (3) and knob (1) and (2) have been tightened by your comrade

Turn the hand wheel c ockwise (as seen from the top) until the counter part is pressed against the exhaust fairing

Ready the protective cap by remov ng the locking pin and checking it

Otherwise--at take-off the rubber seals will burn

Connect four of the five lines of the f.ve fo d coupling to the ground control box

Now watch out!

1. The individual lines are marked and carry a tag with inscript on
2. The corresponding connections at the ground contro box are also marked by tags
3 The terminals for the regu ar main the auxu.ary control pressure line and the filling ine are located at the back plate, theaeration connection at the right side of the ground contro box

Remove the safeguarding dev ces on the tubes and the dust cape on the terminals of the ground control box and check the sea ing surfaces

Screw the dust caps on the prov ded four bolts of the ground control box and carefully safeguard the protective coverings of the five lines

Otherwise--they will get dirty or get lost

Bend the tubes properly and fasten the lines to the des gnated po nt on the ground contro. by utilizing the lock nut Move the tube back and forth slight y while t ghten ng the ock nut

Otherwise--the bevel w.ll not fit and w il leak

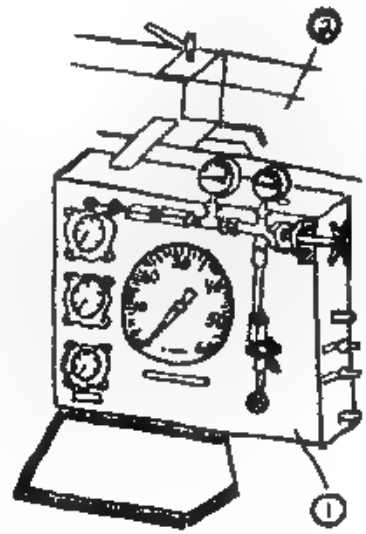
The middle line will not be connected B Substance dr ps from it sometimes Should B-Substance flow from it then report it to your squad leader

Connect the compressed a.r battery of the FR Carrier w th the h gh pressure connect.on on the left side of the ground control box

Then report Ground control box and fivefold coup ng insta led

Should you forget to install the five fold coup. ng, then there will be no connect.on betwen ground and m ssile

Inspection of the ta. screw ngs. Tighten all screws and secure them



Wh e your comrades are working on the ground you will climb to the lower working p atform Take with you the fo ow ng

1 Your tools

2 Check panel, or board

3. The connection lines for connecting the test manometer

Hook your safety cha ns

Otherwise--you will fa.

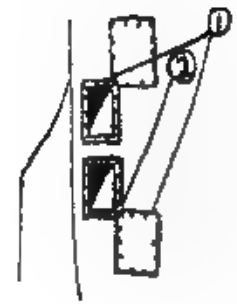
Fasten the check board (1) on the cradle frame (2) of the rocket carr er Open the four power unit shutters 1, 2 3 and 5 Store the screws well and don't let them drop

Otherwise-- They will be missing when needed

(1) Loosen only the last screw It must be a corner bolt

(2) Turn the shutter around this bolt and tighten the bolt slightly

Otherwise-- The hatch may fall down on your comrad



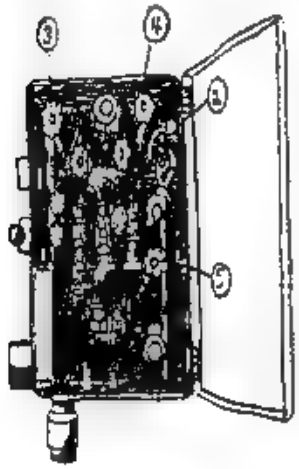
Report Drive hatches open

Load the compressed a r battery as soon as you have rece ved the order Your comrad on the ground will open the hand operated closing valve on the P-Substance battery of the rocket trai er and that of the filling l ne on the ground contro box (1).

Watch the slow increase of pressure on the high pressure manometer located be ow the T Substance container

At 200 atu call out Out off supply

Your comrad will shut the hand operated shut-off valve



Your comrad ad,usts the pressure reducing valve (6) located on the ground control box to approximately 23 atu by tighten.ng or unt ghtening adjust ng screw (7) Listen to and feel the pressure lines Should one of the screws leak then tighten it Should you not be able to fix a leak then report it Connect the contro manometer (8) of the check panel to the provided for plug of the hand operated shut off valve and open it This valve is located at a junction of the low pressure line behind the pressure-reducing valve Open the high pressure hand operated shut off valve located next to the T-Substance filler neck

Set the pressure reducing valve of the A-4. Watch the increase of pressure at the low pressure manometer and tighten adjusting screw (3) at the pressure reduc ng valve where the ock screw (4) must be loose until the calculated value has been reached The calculated value is taken from the accompanying papers Listen to and feel the low pressure lines and remove leaks At the same time make sure that the pressure in the compressed air battery is at least 180 atu

Otherwise--the ad,ustment will be wrong

Open the bleeder screw (1) on the front side of the safety valve by giv.ng t a 1/4 turn to the ieft. The compresed air must come out of the bleeder srew

Determine the amount from the control manometer

Now there are three possibilit.es!

A The determined value corresponds w th the theoret ca value to be used Should th s be the case then
shut the b eeder screw and watch the pressure ncrease through the control manometer
The thusly given value may not exceed the theoret ca value by more than 1 0 atu

Otherwise--the pressure reducing valve is not in order

Loosen the bleeder screw again The control manometer must give a reading equivalent to the theoretical va ue

The d fference may amount to 0 3 atu at the most
Then the pressure reduc ng valve is in order

B The reading .s under the theoret cal value
Shou d this be the case then p ace adjust ng key (2) on ad,ust ng ,ey (3) loosen the ock ng screw (4) Turn the adjustment screw to the r ght and watch the increase n pressure through the control mano meter up to the theoret cal value Tighten the adjustment screw again Shut the b,eeder screw and proceed exactly as described under A

C The reading is above the calcu,ated value

Shou d this be the case then p ace adjustment key (2) on adjustment key (3) Loosen the locking screw (4) Turn adjustment screw (3) w th the key to the left and watch the reduction of pressure at the contro. manometer
Let the pressure drop at least 0.5 atu under the theoretical value.

Now turn the adjustment screw to the right again and proceed as described under B and A

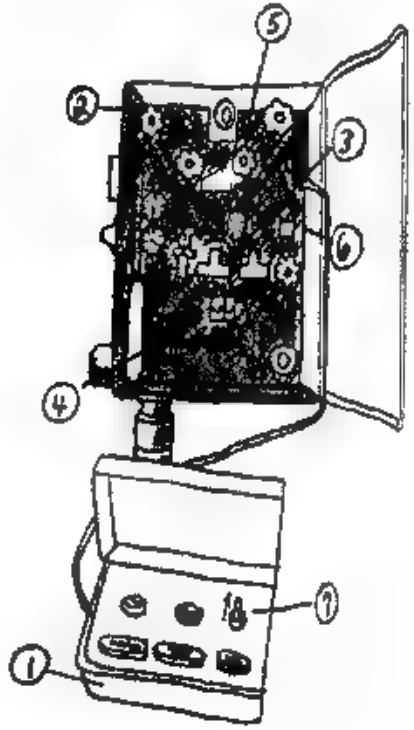
MORAL. F ying or falling of the projectile
depends on the job done here

Checked are these who unite forever

MOTTO You will check to f nd an error

PROPULSION UNIT TESTING

A doctor checks the heartbeat of a human being by using his ear
You check the operation of the valves in the propulsion unit by ear



Propu.sion Unit Test

W th the propulsion unit test you testaeration, the ignition circle and circuit battery

(1) Place your switchboard on the rotat ng ring of the launching platform next to the ground contro. box (2) Sw.tch (7) " gnition c rcle" must be turned on

(3) Put the p.ug nto the counterpart located n the ground control box

(4) Remove the safety cap from the connection of the aeration line of the ignıter equipment

(5) Open the hand va ve of the auxiliary control pressure line in the ground control box

Listen, if the A-Substance vent valve opens with a blunt knock
Report: "Clear for Propulsion unit test!"
The launching eader w l contact the launch control car by phone He gives continuous orders
The sw tch sergeant handles the test-and firing switch located on the propulsion control desk

During testing time you will be just eye and ear.

To the order Launching valve on position No 2
L sten if the A-Substance vent valve closes with a blunt noise and if the aerator va ve opens and whether or not P Substance enters the A Substance container. Watch the increasing A tank pressure at manometer (6) in the ground control box
The vent valve must close at 1 5 atu

Shou d the A-tank pressure drop below 1 1 atu then the aerator va ve must open again

To the order L sten if P-Substance is flowing from pr mer valve (4) If it is then turn off switch (7) "ignition circuit" located on the switchboard

To the order Launching valve on pos tion No 4
Listen if the curcuit battery aerates with two rapid occurring hiss ng no.ses

To the order Turn off al switches
Push back the switch marked "ignition circuit"

MAIN TEST RUN

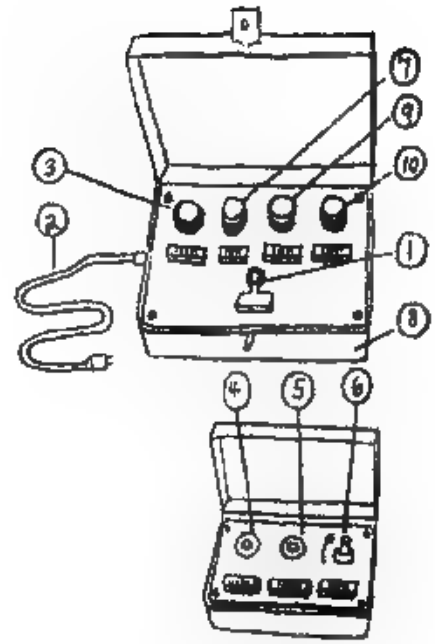
(1) P ace the lamp hous ng on the turn ng r ng of the launching platform
(2) Give the end of the cab e comming from the lamp housing to your comrad on the lower working platform He will in turn pull the p ug of the steam generating plant and connect the cable

Switch (4) "tank pressurizing" and (5) "pressure regulator" of the sw tchboard must be turned off The gn tion c rcuit must be turned on

Again the launch ng platform eader gives his orders by phone to the launch contro car Wh le test ng the following points must be manned

one man at the lamp housing and switchboard
one man watches the ground control box
one man watches the pressure reducing valve (ower working platform)
one man on the upper working platform

To the order Launching valve on position No.2.
L sten if the A Substance aerator closes with a blunt noise See if the left lamp (3) "aerator" located at the lamp housing lights up



At the switchboard the two first switches (4) "tankeration" and (5) "pressure regulator" are turned on and then turned off in the same sequence. When turning on the pressure regulator (5), the aerator valve must open. When turning off the tank-aerator valve (4) must close again.

To the order: Launching valve on position No.3.
Listen if the B-Substance pilot valve opens with a blunt noise. Turn switch (6), "ignition curcuit", located on the switchboard, when the primer valve starts operating.

To the order: Launching valve on position No.4.
Listen if the circuit battery will aerate with two short concecutive hissing sounds.

To the order: Launching valve on position No.5.
Launching valve -check if lamp (7) "high pressure valve" lights up on the lamp housing. Then turn on switch (8) "Z-Substance contact" located on the lamp housing. Check if lamp (9) "8 ton valve" and lamp(10) "24-ton valve" light up on the lamp housing. Your comrad on the upper working platform will wait 40 seconds. Then the pressurizing valve must close with a blunt noise and activate the electromagnetic shut off valve.

To the order: Combustion cut-off.
Check if lamp (10) "25 t valve" goes out.
Watch if lamp (9) "8 ton valve" and lamp (7) "high pressure valve" go out.
Should a lamp not go on or off or should a valve fail to function then report this error immediatley.

To the order:
All Switches off. Disassemble the lamp housing and the switchboard. After the main test run there will be no parts interchanged in the A 4 or in the ground installation. Otherwise: The main test run must be done over again.

MORAL. To test or be tested is not always the luckiest thing in the world.

M ık s the babies food
MOTTO For fueling more exper ence s needed.

Once the main test run is completed, the A-4 is fueled

Hereby you will work together with the members of the propellant battery

Pay attention. Whatever is said about the four propellents of the A-4 on pages 104 to 106 concerns you too

Be Careful When Handling Propellants.

To the order: Ready for Fueling

B Substance. Climb to the upper working platform
Screw the B-Substance fueling hose onto the nozzle of the B Substance ascending line located at the radio trailer
Remove the dust cap from B-Substance hose to the filler neck

A Substance. Put on Safety Clothes

Otherwise -your hands will freeze

Climb on the lower working scaffold
Connect the coupling of the A-Substance filling hose to the A-Substance ascending line of the rocket trailer
Check the filling connections to see that they are clear of dirt, oil or moisture

Otherwise--you will have an explotion or the connection will freeze

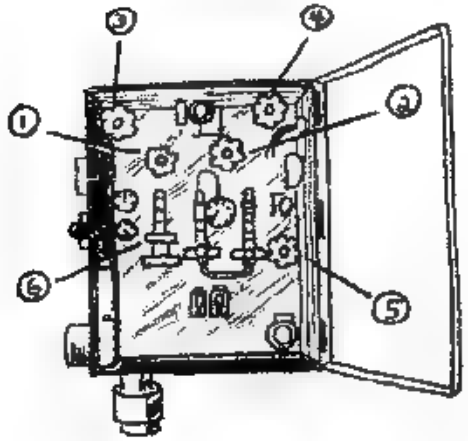
FUELING

Remove the dust cap from the A Substance filling nozzle

Screw the filling plug connection with the large hand wheel (1) onto the filling valve-

Turn the smal hand wheel (2) counter clockw se unt l you hit a stop

Test the back pressure lids in the high pressure and emergency lines for t ghtness.



Shut supply valves (1) and (2)

Open bleeder valves (3) and (4)

Only the pressure remaining in the lines may now escape

Otherwise--one of the automatic check valves is leaking and must be replaced

Now close valves (3) and (4) again

Open valves (1) and (2)

Otherwise--the A-Substance tank may burst

Connect the extens on p pe for the A-Substance b eeder tube
and if possib e dig a small drain d tch at the outlet

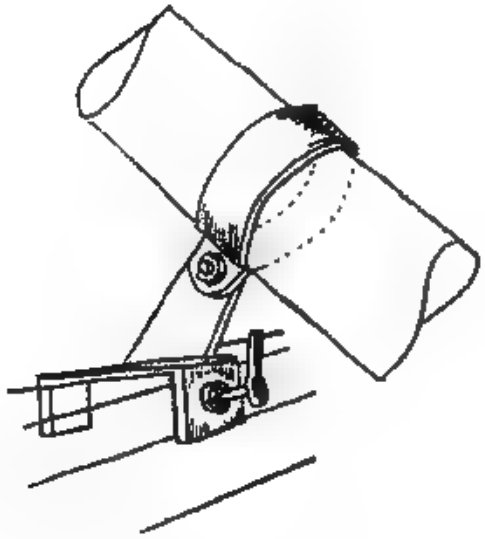
Connect the p pe with attach.ng device

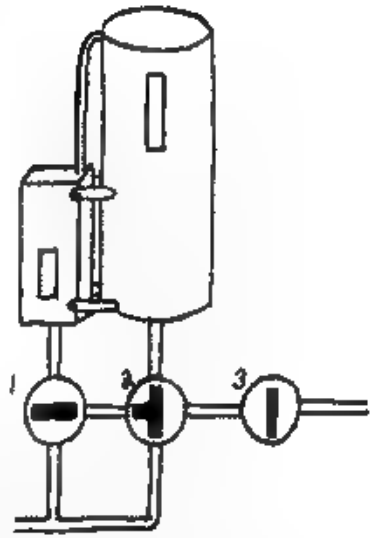
Set up your hot air b.ower and connect the pressure hoses

T-Substance Have your water supply ready

Put on T-Substance protective clothing

Otherwise--you will be burned





Remove the valve cone on the T-Substance filling nozzle
Place the extension pipe on the filling nozzle
Screw the one end of the T-Substance filling hose on the outlet nozzle of the measuring tank and the other end on the extens on
Adjust your valves located under the measuring tank as listed below

Report. "Ready for Fue.ing "

To the order Fuel with B-Substance.

Check if the B-Substance lines are sealed Keep the proper gaskets handy

During fueling of B Substance

Fill the compressed air booster battery in compartment IV of the instrument compartment

Climb to the upper working scaffold Close the hand shut off valve located in the line between compressed air booster battery and B-Substance tank through the opening in the partition of compartment III

Connect a line between the breather valve of the filling line of the ground control box and the filling sleeve of the compressed air booster battery Install this line so that it runs up on the outside of the A-4 Your comrad on the ground will open the breather valve of the filling line in the ground control box Watch the pressure increase in the compressed air booster battery through the manometer At 200 atu give the order "shut off supply" Your comrad will shut off the breather valve of the filling line in the ground control box

Disassemble the connection line between the breather valve of the filling line in the ground control box and the filling sleeve of the compressed air booster battery

Open the hand shut off valvet marked fuel tank pressurizing at the B-Substance tank Determine by touch whether or not the heating system of the pressure reducer is turned on

To the order' Fuel with A-Substance'

Utilize the hot air blower and blow hot air at the serve unit shutters Check if the A-Substance lines are leak proof Manipulate the fittings with nothing more than a wooden hammer

Otherwise they will break off

Move the small handwheel of the fueling fitting

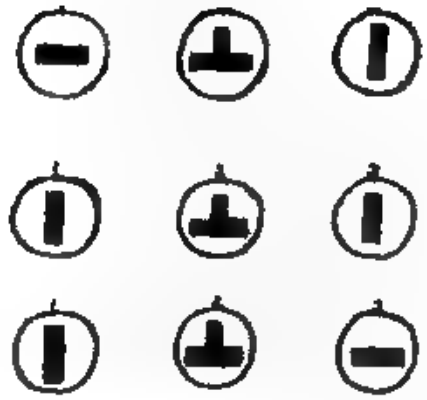
Otherwise--it will stick

To the order Fuel with T-Substance. Watch the increase in T-Substance through the eight glasses of the measuring and overflow container

Otherwise--your comrad will not turn off the pump in time and due to over pressure T Substance may squirt out

then

If your comrade has shut off the pump switch valve (2)



Place valve I on flow b eeding

For fueling the A-4 turn valve No 3 on flow

Observe the running over of T Substance through the measuring g.ass within the filling hose

If your turn valves 2 1, and 3
No T-Substance will be spi ed

After Fueling.

Remove the B-Substance f lling hose Turn the small hand wheel on the A-Substance f ler neck coupling, c ockwise unti the pressure point has been reached
Remove your A-Substance filling hose with the coupling
Screw your safety ids on the A and B Substance filler neck nozzles
Remove the T Substance hose after you have dra ned t completely
Lower your hose for rinsing Watch that nobody is in the way
Remove the extens.on piece from the T-Substance nozz e and tightly screw on the nut cap

Otherw.se--pressure will be lost here

If you don't want to lose pressure
Secure your nozzle well

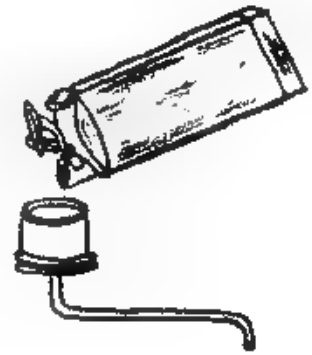
The Combustion Unit

It was checked in the meantime by your p atoon leader to see whether or not the welded seams and the soldered nozzles are leak proof and if the 18 cardboard coverings are spaced properly

In addition he climbed the ladder and checked the lines ocated in the tail unit for leakage

Otherwise--one may expect a tail unit explosion

It is slightly difficult for a fat man
to squeeze into a combustion unit



To the order: Fuel with Z-Substance.

Fetch the Z-Substance conta ner from the pre-heating dev ce Be sure that the container has been heated well Shake the ingredient well
Remove the coupling piece from the Z-Substance fil er neck
nstall the filling funnel
S owly fill up with Z Substance
Remove the funnel and lower it for washing
Close the Z-Substance container with its coupling

Otherw.se--you wil loose pressure.

Remember. Never fuel Z-Substance and T-Substance together.

Should Z- and T-Substance be mixed during fueling
Then you w .l soon be on fire

Check the pressure of the P-Substance compressed air battery t must amount to 200 atu

Otherwise--you wil endanger safe firing

Check the theoretical value of the pressure reducer C ose the hand shut-off valve. Remove the control manometer
Close all shutters Be sure the shutters are seated properly and that no screws are missing

Otherwise--the shutters will dismantle in air
Anyth ng wh ch dismantles in a r was not checked prpperly before

Install the A-Substance oxygen replen sher coupling.

Remove the valve cap on the A-Substance replen shing ne between Fin No 1 and 4 Loosen lock (1) in the groove of the launching p atform

Fit the base of the dev.ce into the groove

Loosen Lock.(2)

Turn the hand wheel (3) to the right (as seen from the top)

Check the coupling and whether or not the sealing surface is undamaged and the coupling parts are free from dirt, oil, and dampness

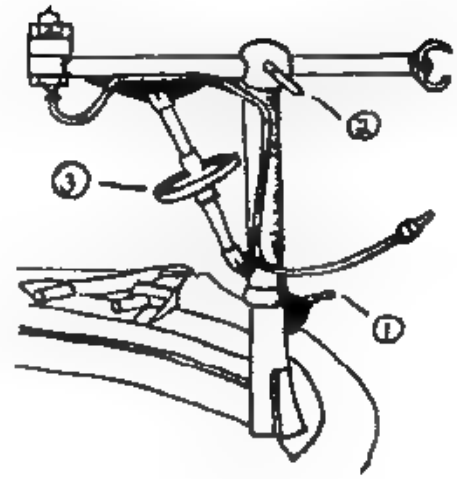
Align the counterpart to the replenishing line and press the counterpart against the upperpart of the coupling at the exhaust fa ring

T.ghten levers (1) and (2)

Turn the handwheel to the left (as seen from above) unti. the counter-part rests snug aga nst the upper part of the exhaust fa ring Connect the compressed air p ping from the pipe connection at the underside of the ground contro. box to the oxygen replenisher coupling.

Check for leak ng lines when refueling

Remove the extens.on p pe of the A-Substance breather tube when refue.ng has been completed



MORAL:

You confine dangers within their borders
f you are careful while fueling

MOTTO: The ignition must wake the powers contained in the A- and B-Substance

THE IGN TION SYSTEM

The energy contained in the A- and B-Substance is released only then when both propellants are proper y ignited Therefore you will need an ignition device

INSTALL NG THE GNITER TORCH

Unscrew dust cap (1) from the anvil head

Don't forget to remove the plugs from the connection nuts of the connecting lines

The connect ng lines of the igniter torch wi l for once not be blown through.

Check magnesium band (2) for damage and tight connections. Check whether or not it is spaced evenly from the anvil head

Check if the connecting wires (3) and (4) are kooked up tight and if they are spaced equally from the anvil head

Remove the connecting w res and wrap them t ghtly around the crossbeam

Otherwise--they will touch and ign t on control is endangered

Insert the igniter torch into the combustion chamber

Fasten the horizontal strip in the tin-holders to the bottom side of the stern frame

Be careful not to hit against anyth ng

Otherwise the magnesium band will be torn off

Connect the wires of the ignition control circuit to the clamps of the ground control box

CONNECTING THE IGNITER FLASK

Put a bucket of water on the side

Otherwise--you will not be able to help should T- or C-Substance be contacted

Remove the plugs from the breather connections (1) and screw in the pressure

Put the igniter flask into the designated basket at the launching platform clamp (2)

Remove the connecting nipple from the drain nozzle.(3)

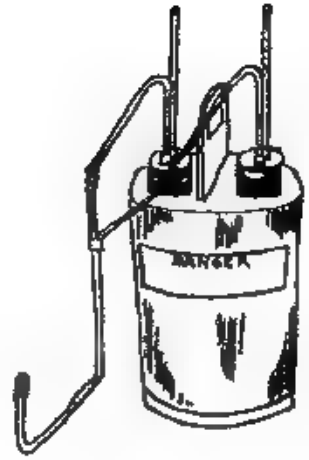
Attention! Always loosen the breech plug (1) first and then the female connecting nipple (3)

Otherwise--the ignition fluid may spray out because of over-pressure

Blow out the T- and Z Substance feed line

Be careful--the lines may contain some fluid residue left over from before

Connect fuel line (4) to drain plug (3). Connect the fuel lines with the lines of the igniter torch



Only by order!

Connect the compressed air line from the ignition valve of the ground control box to line (2)

MORAL Follow instructions well or your loved ones will mourn you

THE ELECTRICIAN CREW

Electric batteries supply the airborne A-4 with current
These batteries are installed at the launching site only.

Prior to take off of the A-4 the steering mechan sm must function perfectly
It must therefore be tested prior to take off

Radio devices n the A-4 transmit signals during fl ght They are g ven from the ground.
It is therefore necessary to test al devices prior to launching

The e ectrician crew performs this job
You know now just how much depends on your accuracy and conscientiousness

MOTTO A person who catches on slowly usually suffers from a short c rcuit of the brain.

CURRENT STROM

Current s needed in order to operate the rad o and steer ng devices of the A-4

Current gives the A-4 the order for take-off

Current makes it possible to send orders to the a rborne A-4

Current is needed by the A-4 in order to follow orders.

Current ign tes the fuse

Current ignites the high explos ve upon impact

Your source of the current in the A 4 is

1. the 27-volt course gyro battery,
2. the 50-volt course gyro battery

You are to install them in the rected A-4

n order to preserve the force of currents in the A-4 there are several sources of current nstalled in vehic es They de iver the current as ong as the A 4 is on the launching s te Under utilization of spec al cables and p ugs you w l deliver the current to the A 4 The two p ugs are called magnetic plug No 1 and 2

The moment of take-off is especially important

It w ll show you if you have done your job correct y

Important devices n the A-4 and on the ground must start to operate at this moment They start to operate due to take-off contacts that signa. the takeoff of the A-4 One cntact signals the A-4, the other the ground installation

The instrument compartment harbors severa delicate dev ces Protect them from dust and dampness when you open the doors to the nstrument compartment

PREPARING THE MAGNETIC PLUGS

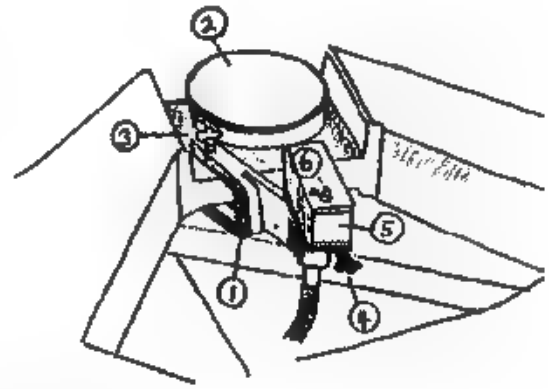
Prior to the erection of the A-4 remove the magnet c plugs from the transport frame of the Rocket Carr er

Otherwise--you are forced to pul the connecting plugs up to the working platform a ongside the erected A-4

Be careful that upon erection of the tip frame the cab es to the magnetic plugs do not get caught n the frame of the F R Carrier

Otherwise--the cable will break

TAKEOFF CONTACTS



Before you erect the A 4 fasten the counterpart of the m ssile mounted takeoff contacts on the launching platform under fin 2 and then fetch the ground takeoff contact

Upon erection of the A 4 push its clamp (1) located adjecent to plate (2) under fin (3) from the ins de of the launch ng platform

Tighten screw (3)

Untighten screw number (4), push switch (5) from below against the fin in such a way that the push button (6) is depressed

Then tighten screw (4) again
Connect the cab e of the takeoff contact to the socket to the ground control box

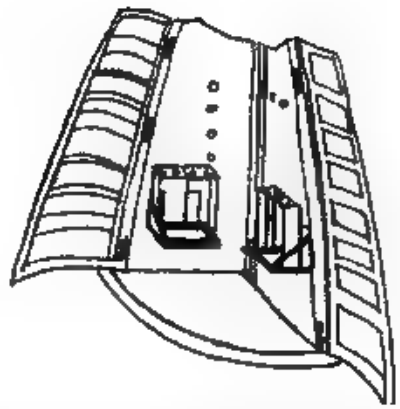
NSTALLING THE FIFTY-VOLT COURSE GYROBATTERY

At low outs de temperatures store the battery in the test car so that it w ll not get cold Take the battery and check for a 50 4-volt potential Don t forget to press the inductance button on the vo t meter from 10 to 20 seconds

Open door III to the fl ght contro compartment of the erected A-4 and pull up the battery w th the elevator Install the battery and tighten the mounting stand well

Make sure the connections between battery and bus are correct + to + to -

Otherwise--you are forced to reverse poles and waste time



INSTALLING THE TWO 27-VOLT COMPRESSED A R BATTERIES

At low outs de temperatures and before nstalling these batter es are to be placed in the test car Fetch them by utilization of the vo t-meter test them to make sure they are fully loaded

The load of each battery must then contain 16 volts. Do not forget to press the inductance button of the volt meter 10 to 20 seconds

Test to see that the poles are not grounded

Open door I to the instrument compartment of the A-4 and pu up the batteries

Both ends of the battery are to be connected from plus to m nus The m ssile mounted terminal boards however are to be connected + to + and - to Otherw se--you are forced to reverse the poles ater on and cause delay in aunching.

Close door I

INSULATION RESISTANCE

At the counterpart of the magnetic plug 2 measure the insulation resistance between the P us-Term.nal Board against earth as well as the Minus-Term nal Board against earth The resistance must be about 500 000 ohms Your meter is sens tive Hand e it with care

PLACEMENT OF THE MAGNETIC PLUGS

Grease the housing of the magnetic plugs Plug in magnetic plug 1 to section 2 of the instrument compartment first. Then plug in magnetic plug 2

Otherwise--if you don't they will not hold

Should the plugs fall off the current necessary for the holding magnet will be m ssing Check the ground source in the power supply carrier Until launching time keep the plugs from fall ng off by fastening them to the upper working platform by means of the chain.

MAIN TEST DRIVE

During this test the two magnetic p ugs w ll fall You must prevent them from falling down completely C mb to the upper working platform and loosen the safety chain Hold the magnetic p ug cab.es approximate y one meter from the plug and pull slightly in the direction of the plug Hold on tightly when the magnetic plug falls out

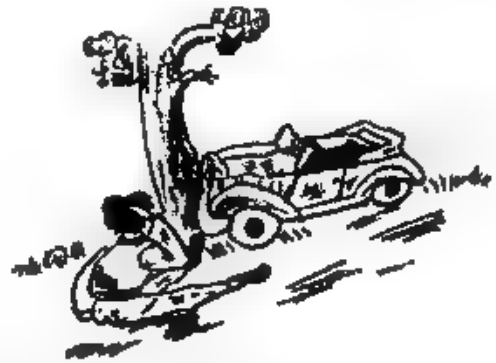
After the test do not forget to plug in the magnetic plug again In addition you are to check and see that the batteries under stress do contain the prescribed amount of voltage (27 or, as the case may be, 50 volts)
MORAL. Dur ng your work never forget enemy, heat, dust or dampness.

When it is too late people often say
MOTTO: I wish I would have steered a tt.e better.

THE STEERING DEVICE

Shooting itself is not hard but to hit the bull's eye is The barrel directs the rifleman's bullet and so does the gun barrel, the shell The A-4 is not shot from a barrel and therefore needs a different kind of gu dance A steering device is used for this purpose.

Your automobi e wou d run off the road should you not steer it correctly, or should the steering device be defect ve, or set wrong The A-4 has automatic flight control .f you have set it correctly it will operate automatically upon takeoff



The A-4 has 8 Rudders, 4 of them lie in the air stream, there are air rudders, 4 lie in the jet of liquid fire, caused by the departing flue gas, called jet-rudders The air rudders are thin and are located at the outer lowest edge of the four fins. The jet rudders consit of graphite and are mounted below the combustion unit.

Sometimes the air and jet rudders operate together, sometimes separately.

The four fins are numbered Fin 1 points n the direct on of the enemy Should you be behind the launch ng platform and the installed A-4 that is behind Fin 3 then remember.

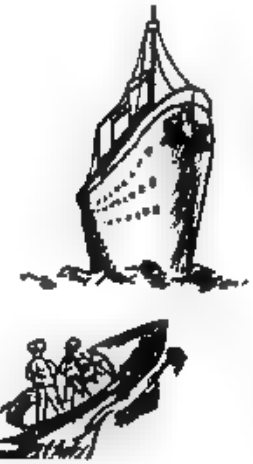
Fin 2 is to your left,
Fin 4 to your right

The air rudders 2 and 4 are called trim tabs You cannot adjust them by hand. They are to even out construct ve errors

MORAL: Especially when launching a Rocket a missing steering device will ring disaster

MOTTO: With the pitch gyro and roll and yaw gyro the course of the A-4 is plotted

THE PILOTS OF THE A-4



A pilot boards a boat. He knows exactly what couse to take, the location of the sandbanks as well as the direction and strength of the current. He safely guides the boat past all dangers to the harbor and point of destination. But in order to steer correctly, the pilot must know the location of the boat. Two pilots are aboard the A-4.

They accompany the missile from time of launching to combustion cut-off. Then they have completed their job. They give the commands to the individual rudders of the steering device. They know exactly when the A-4 deviates from the prescribed course. They are called pitch gyro and roll and yaw gyro.

The pitch gyro is installed in a level casing. You'll find it in section II of the instrument compartment. You can get at it only by way of the upper working platform. The pilot eye is located in this casing and reacts toward any deflection from the prescribed course. It is a fast moving gyro fastened to two rings in such a way as to enable movement in every direction. Such a gyro has the characteristic of remaining in the original position. Should an unusual deflection occur between the gyro and its housing, the gyro will notice it.

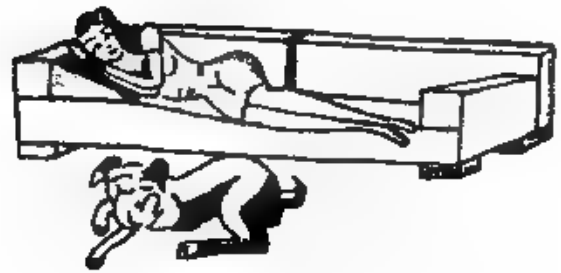
The roll and yaw gyro, the second pilot of the A-4, is housed in a vertical casing. It, too, may be located in section II of the instrument compartment and also contains a movable gyro. It prevents the A-4 from turning longitudinally and prevents a side deflection from the desired path of the trajectory. Pitch gyro and roll and yaw gyro must be placed in a certain position on the A-4. The housing may therefore be adjusted by turning the adjusting screws.

If the gyro notice a deflection from the desired path of the trajectory of the A-4 an electric current or so-called control current is released This affects the pr me mover of the rudders (vane or servo motor) n such a way that the A 4 is brought back With n this circuit there is a contro amplifier which so to speak gives its commands to the individual rudders according to the reports received from the two pilots.

Pay attent on to the following

The gyro are able to perform their job only if they are seated correctly. Upon starting up it takes 3 minutes until the gyro have seated correctly.

Remember it takes you sometimes severa minutes to get situated



MORAL: Even we must often admit not being capable of stat ng our course or whereabouts.

MOTTO At last it shall be made clear,
Whar to do to make it c ear

It takes a so dier 20 minutes to ready his sa boat and prepare it for sailing The tr.p through wind and waves may then begin

To clear the steering device you have 20 m nutes time If you f nish all your duties in the prescribed t.me you will save time

While clearing the steering device, test interferences artificially through air gusts etc , just as hey occur during flight

Dur ng testing of the steering device the A-4 must be mot onless

Contact the launch contro car by phone Here the corpora in charge of the contro.s watches the angular disp acement of the control surface and also the control current at the control desk He wi.l g ve you the orders

Remov.ng the Fin Shoes
Prior to erection of the A-4 loosen the screws and remove the fin shoes

Installing the ,et rudders
Set up the 4 rudders so that they are within reach

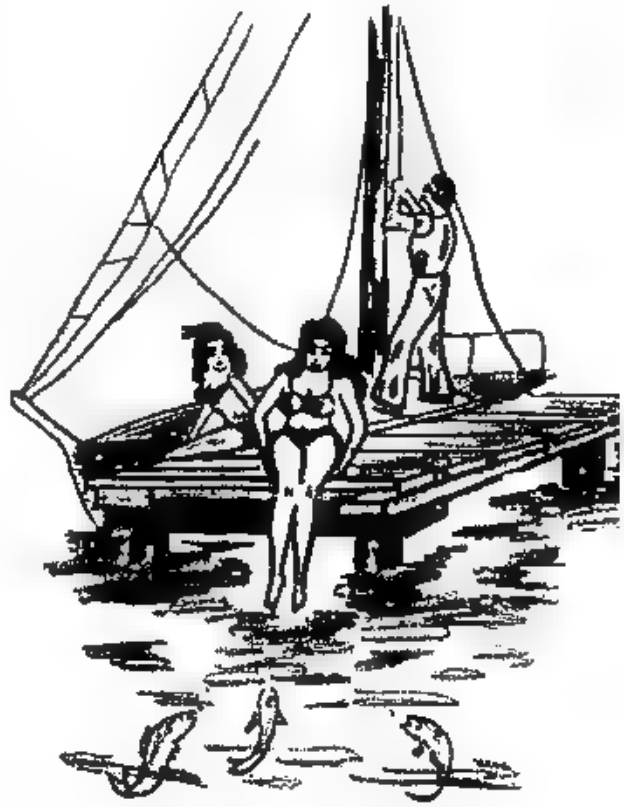
Check the rudders closely. Cracks irregularities and loose frames make them useless

Screw on the rudders

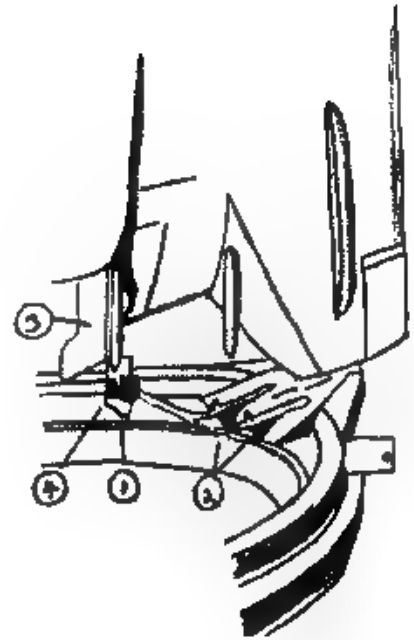
Do not forget to place the 4 spacing washers at the end of each rudder Tighten the screws well Install the safety plates

Do not fix the rudders now but ready rudders 1, 2 and 3 for fix ng

MAKING READY FOR LAUNCHING



Insert the jet rudder bracket (No 1) from the inside of the launching platform into the provided for connecting pipe (No 2) so that the rudder nose (No 3) is located in the groove of the mounting stand
Do not use force Should the bracket not fit then oosen the screws (No 4) and readjust the retaining clamp
Now remove the jet rudder brackets and place them under the respective jet rudders



Adjusting the Steering Device

To the order: Rectify control current No 1, you open the shutters to the four vane meters
Change the potentiometer in the vane al gnment box until the order "stop" is given
Do likewise with regards to control current No 2, 3, and 4

To the order Level.
Loosen the locknut on the leveling bracket turn the two adjusting screws uniformly until the order "stop" is given

To the order Adjust roll and yaw gyro Loosen the locknut on the roll and yaw gyro bracket, turn the adjustment screw until the order "stop" is given.

To the order Rectify control current No 1 and 3
Do as you did above
You must adjust the steering dev ce by turning and testing as little as possible

Synchronization and testing of the vane meters

After receiving the order to do so check if both rudders move equally fast towards F n No 3 and then towards Fin No 1 even when pressing aga nst them Then report by telephone-synchronization clear Check if the rudders No 1 and 3 move about the same from O to Fin No 2 and then to Fin No 4 When pressing against them pay attent on to the sound of the operating vane meter Precision adjustment for synchron zat on of the co aborating vane meters and for the standstil. in the zero pos tion is next Watch the synchron sm of the rudder pa rs and make corect ons by adjust ng the balance potentiometer In doing this you must produce a standst of the rudders within the zero position w thout interference

Test'ng the Set-up

As soon as g.ven the order adjust rudder No 2 and 4 accord ng to Fin No 3. Watch the path of the rudder. The "sw tch" corporal in the launch contro car counts from 21 to 24 After that rudder No 2 and 4 must move towards F.n No 1 evenly and then stop even when pushing aga.nst them.

Testing the Trim Steering

When given the order adjust rudder No.1 and 3 somewhat contra.

Then check f the trim tabs move in the same direction that rudder No 1 and 3 are standing
Then report "Trim tabs move correctly"
If the trim tabs return to the zero posit on mmediately then report "Trim steer ng clear".

General Test Run

After rece ving the order "Take off" (this is approximate y 2 seconds after the magnetic plugs have fa. en After Fuel ng off) remove the take-off switch and count aloud from 21 to 24
Check .f rudder No 2 and 4 run out to Fin No.1.
Then report "Program clear"
Turn rudder No 1 around the zero position and watch the d'rection of the trim tabs
Then report "Trim steering clear"
P ace the take off switch nto the old pos t on Tighten the screw well

After Fueling

Upon fueling and renewd erection and after turning the A-4 in the d rection of fire, the control currents must again be rectified if necessary

Take Off

For take-off jet controls No 1, 2 and 3 must be fixed

MORAL: Once the last one has fina y caught on
Then instead of "clear" it will soon be "naturally"

FREQUENCY DOUBLER AND COMBUST ON CUTOFF

MOTTO Dear friend this A-4
is really great,
Because you can get rid of the
"spirit" at combustion cutoff

If the "spirit", meaning the "B" rocket propellant, is ignited, then it will burn together with the "A" rocket propellent and propel the A-4 Accelerat on will increase steadily. The propu sion unit will be cut off at a certa n speed In order to accomplish this you must induce a combustion cutoff The fire n the combustion unit will go out and the A-4 wil f y The fir ng range may be changed by cutt ng off combustion at various accelerat ons

For giving combustion cut-off via radio, the combustion cut-off flight instruments are

No 1: Frequency Doppler

It receives a certain number of electrica frequenc es per second and sends back twice as much The frequency doppler s needed in order to determine the veloc ty of the A-4

It is similat to the clerk in the bank who accepts a ten mark b l and then in return hands out twice as many five mark bills

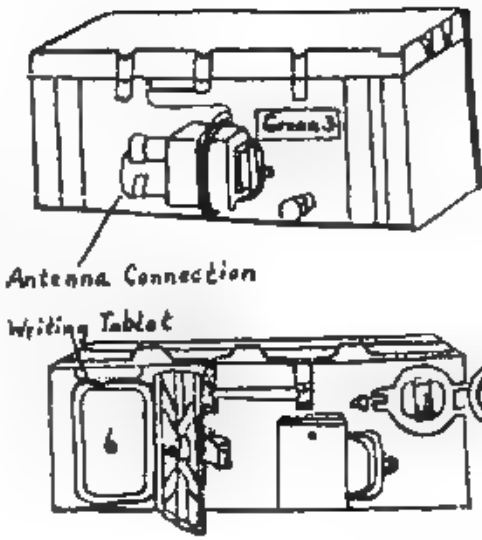
No 2. The cutoff Signal Receiver

It must stop the driving mechanism and this at a certa.n combustion cutoff The receiver wil transmit the sound on y at a certain sequence of rad o waves.

You are to test and watch over the two flight instruments
The test may start as soon as the magnetic plugs are plugged in Prior to this you must however perform certain preparatory duties.

Duties to be performed in advance

On the still horizontal A-4 check and see that the correct flight instruments are installed according to the frequency Open shutter No 1 of the instrument compartment
Should, for example, the order of frequency be "green3", "red 6" "301" "Anton" then test the following



No 1 Frequency Doppler
Check if the frequency doppler No.3 is installed and see that the connecting nut for the antenna binding posts are tight

Remember. Should the frequency doppler be connected with another number then change the entire device it is not necessary for you to readjust the doorframe antenna

No 2 Cut off Signal Receiver
a) Check if a cut-off signal receiver with the label of group number 301 is installed.

Remember: If another number is marked on the receiver then change the entire device

b) Check if a high frequency charge No 6 is installed in the cut-off signal receiver (left rectangular shutter)

Remember. Should a high frequency charger with a different number have been installed, then the receiver itself is not changed You will however change the high frequency charger Shut the shutter to the high frequency charger well
Otherwise. the cut off signal receiver will be useless during flight

c) Check if a sequence selecter plug "Anton" has been plugged in (right round shutter)

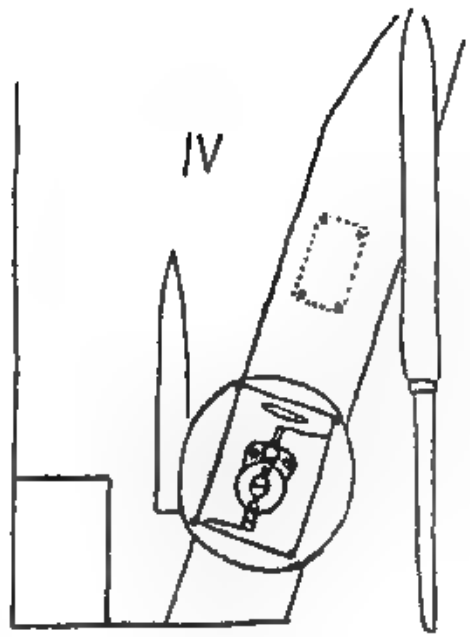
Remember. Should for example a sequence selecter plug "Konrad" have been used then interchange it with "Anton". Again close the shutters well.

d) Check that the trim condensers on Fin 2 and 4 are set correctly

At a frequency of red 1---3 set on mark 2
red 4---6 set on mark 5
red 7---9 set on mark 8

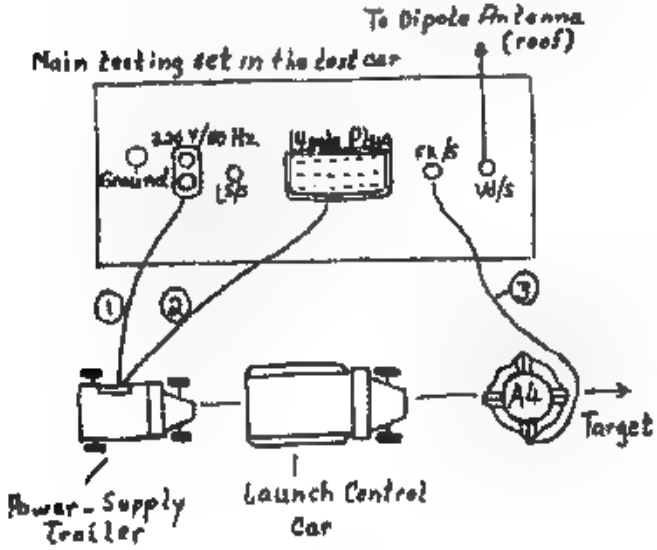
Therefore, after receiving the frequency order "red 6", set the trim condenser on 5.

To the order: "Ready test car for flight instrument testing"
Move the test car 30 to 50 meters away from the A-4 and gead it into the direction of fire



PAYING OUT AND TESTING THE CABLES

(1) Place the power line cable 220 V/50 Hz from the test car to the power supply trailer, connect it to the B-Frame in the test car



(2) Place the connecting cable (signal cable) from the test car to the power supply trailer (relay box) and connect it to the test car It leads to the 14 pole p ug

(3) Place the high frequency cable from the test car to the A-4 (Fin 4)
There you will protect the cable from burning by ut i:zing asbestos
Do not connect the high frequency cable to the apparatus yet. The cable should not be bend By utilization of the Isolavi-instrument measure the isolation resistance It must be larger than 10,000 ohms

At a lower measurement value the high voltage cable is to be changed
Imm diately after erection of the A 4 plug the high vo tage cable (plug) into the right jack on Fin No 4 and protect the antenna plug from be ng torn off by utilizing the cable ho der on the launching platform.
In the test car, measure the grind resistance with the Pantavi Instrument It is to be smaller than 10 ohm
At a correct value, connect the high voltage cable in the test car to the high frequency inkage "FK" at the top-side of the "B" structure.

Remember. Should the value be larger than 10 ohm then measure the signal antenna of the A-4 to Fin No 4 first and this by utilization of the Pantavi Instrument The resistance must be between 0 4 to 1 7 ohm By doing this you will be able to determine if the defect is in the connecting cab e or in the A-4 or as the case may be in the cut-off signal receiver. Insert the dipole antenna into the providedfor holders located on the roof of the test car

The "B-Frame"

The "B-Frame" in the test car is utilized for testing the doppler and the cutoff signal receiver It contains numerous fields and looks like this

Field No 1-net supply and mon toring field

Field No 2 frequency change stage

Field No 3-field of operation transmitter "red"

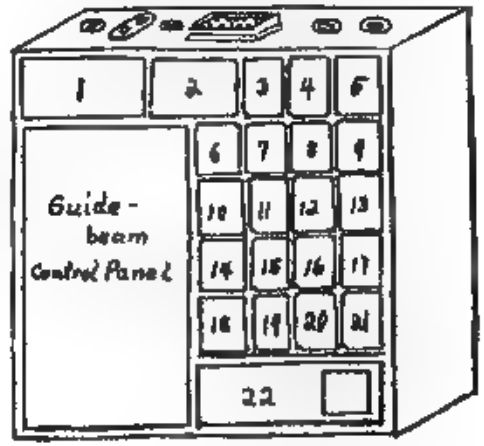
Field No 4-field of operation transmitter "green"

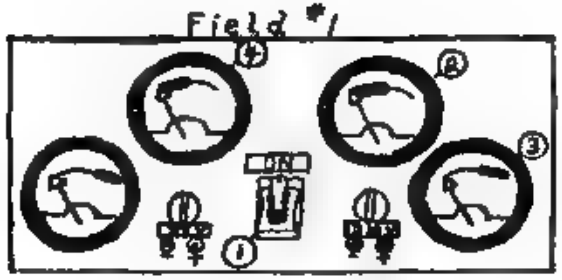
Field No 5 is empty

Fie d No 6 to No 13-transmitter "red" for alternating frequency

Fie d No 14 to 21-transmitter "green" for alternating frequency

Fie d No.21-cutoff signal modulator

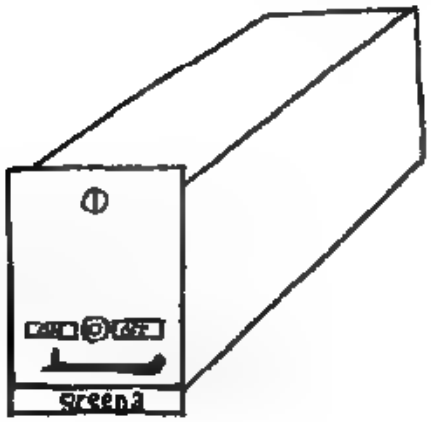




PUTTING INTO OPERATION

Field No 1--Place switch No 1 on "in"
See that the deflection of the pointers of the measuring devices (2) and (3) for circuit pressure are within the "red" zone.

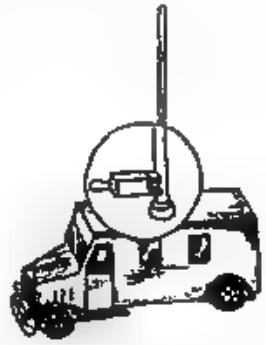
Remember, At deviation, be sure to request the proper current from the current supply trailer
The deflection of the pointers of the measuring device (4) and (5) for DC voltage and current must lie in the "red" zone



Synchronization of the Vo-measuring device

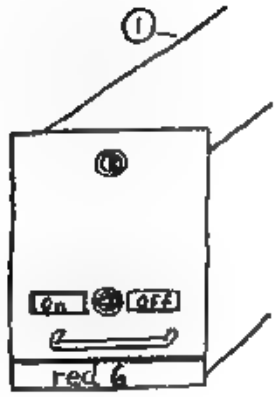
After being told what frequency to use, plug the test oscillator "green 3" into field No.4 Check if the test oscillator operates in Field No 4

1-Turn the rocker-arm of the test oscillator in Field No.4 on "red"
2-Take the doppler test case to the roof of the test car and fasten the fittings to the foot of the antenna rod in such a way that the measuring device will produce a maximum deflection The deflection must lie within the blue zone



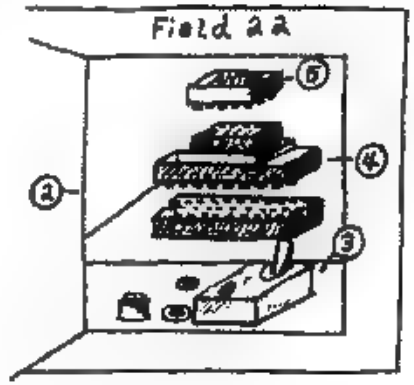
Remember: Should there be a false deflection or none at all then take a spare test case and repeat the test. Should you again obtain no results, then the error will lie in the doppler test oscillator

3. Disconnect the test oscillator in Field No.4



SYNCHRONIZATION OF THE COMBUSTION CUT-OFF DEVICE

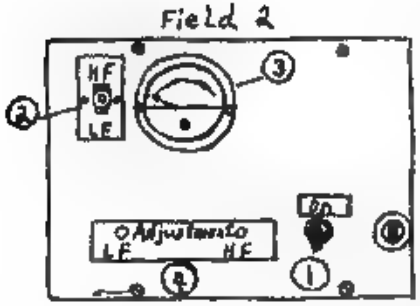
(1) After being informed of the frequency p ug in test oscillator "red 6" into Field 3
(2) Open the shutter in Field 22
(3) Push the lever up n Field 22 so that it points to "in"
(4) In Fie.d 22 connect the series plug 301 with the cut-off s gnal modu.ator after receiving the correct frequency
(5) In Field 22 connect the designated sequence selector p ug "Anton" w th the ser es plug 301



CHECKING THE HIGH FREQUENCY

In Field 3 place the lever of the test osc. ator on "in"
In Fie d 3 place lever (1) on "in" and lever (2) on the high voltage marker
In Fie d 2 check if the deflection of the po.nter of the measuring device (3) is within the red zone

Remember Shou d the def ection not be correct then regulate the high frequency adjustment (4) with a screw driver



CHECKING THE AUDIO FREQUENCY

In Field 2 place lever (2) on low frequency
Check if the deflect on of the pointer of the measuring device (3) is now in the "green" zone

Remember. Should the deflection not be correct then regulate the low frequency adjustment (4) with a screw driver

n Field 2 place the switch lever (2) on the middle posit on
n Field 3 place the switch lever of the test osc. lator on "off"

TESTING THE DOPPLER

Remember. The test may start as soon as the magnetic p ugs are connected Call the launch control car and g ve the order "Connect the Hydrant" (Hydrant is a code for a type of combustion cutoff system for guided missile V 2) Due to this, Transformers (3) will start up in the A-4 Doppler and cut-off s gnal receiver receive current

Cl mb to the upper working platform of the aunching-car with the Doppler test case From there you will call the test car and order "Connect the test oscilator green".

Check the door frame antenna with the Doppler test case
The deflect on of the pointer must e with n the b ue region

Remember Should the deflection of the pointer of the test oscilator not return to ts original position, after being disconnected then the Doppler must be inter-changed.

TESTING THE CUTOFF SIGNAL RECEIVES

Testing may begin as soon as the magnet c plugs are connected The actual test takes place in the launch control car After rece ving the order you will connect the following sw tches, located on the B-frame

1. Switch located in field number III (Transm tter red)
2. Switch located in field number II (Frequency changer)
3. Switch located in fie d number 22 (Out-off signal modulator)

a) Unarmed test
Check if the deflection of the pointer on the B-frame in field number 2 goes through the green region when the switch is in a downward position

b) Armed test
The B-frame necessitates no checking
After complet on of the test disconnect all switches as soon as you are given the order to do so

MAIN TEST RUN

F ve minutes pr or to test begin plugg ng n all instruments Check if after removal of all magnetic plugs n field number 1 of the "B-frame" the deflect on of the pointers of the measuring device (2) and (3) return to zero After completion of the test d sconnect a l vo tage from the B-frame

LAUNCHING

After receiving the order hook up the B-frame again The B frame s to be put into operation at launching time for the following reasons

t s not poss b e for the magnetic plugs to fall and the gn tion to be on, the A4 however due to an error not take off By radio you are then ab e to immediately give combust on cutoffs by way of the high voltage cable

MORAL Without radio and rad o communication a combustion cutoff at the proper time would be impossible

MOTTO It is important for you to know
that by utilization of the J-Device
combust on cutoff devices are quite
unnecessary

THE J-DEVICE

Years ago one was forced to look up at the tower clock to know what t.me it was

f the tower c.ock was not vis.ble and if you could not hear it one d d not know just how late it was. In the days gone by however, this was not very important Today one utilizes a pocket watch, this s much more convenient one is not therefore dependent upon the tower clock Our combust on cutoff system corresponds with the tower clock We do not however measure the time but the veloc ty of the a rborne A4 for we must cut off the power of the A4. For we must cutoff the power of the A4 at a certain velocity n order to make the A4 reach the required firing range

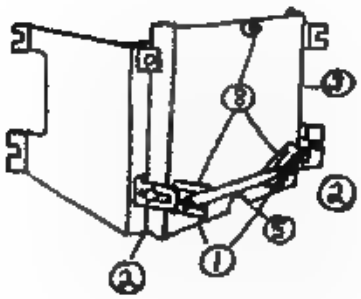
The enemy w.il now try through his own radio devices to jam our radio comm.unicat on between cutoff ground and aircraft apparatus A velocity test ng dev ce was therefore sought (which compares with a pocket watch) ment oned above and which operating completely independent is carried by the A4 This device s not affected by any interference from the outside The apparatus is called "integrater" of "J Device" At a set cutoff speed it cuts out the driving mechanism of the A4

Remember If the J-Device is utilized no combust on cutoff apparatus is installed, and it is not necessary to set up the cutoff ground installation

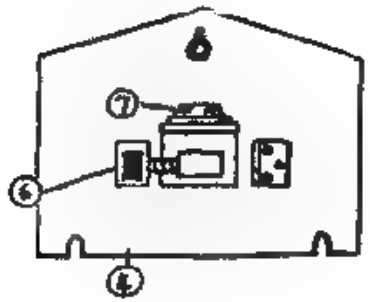
When installing the device JG 1/1 3 you are to perform the fo lowing duties

1 Adjust the support of the J-Device and bring t into the correct pos tion
2 Hang up the J-Device and connect .t
3 Engage the J-Device
4 Adjust and test the cutoff speed (firing range)

THE ADJUSTMENT DEVICE



is used for adjusting the support of the J-Device 1/1--3
You will use the clinometer for setting
Loosen the reta ner screw (1) of the supporters rotatable machined strip
Loosen the sw ng bolts (2) of the rotat ng part of the frame (3)
Fit the adjustment dev ce (4) into the support
Be sure that the lower edge of the ad,ustment dev ce is seated upon the rotatable machined strip (5)
Fasten the adjustment device by tightening the three retainer screws (8) so that they may be easily turned by utilization of the precision ad,ustment drive (6) for tilting to the left or as the case may be to the right
Turn the precision adjustment drive until the airbubble in the clinometer (7) is in the center
Tighten the three retainer screws (8) of the adjustment device and bolt screws (1) well At the same t me check if the airbubble of the c inometer (7) remains in the center. Turn the rotatab e support (3) in such a way that the air bubble of the clinometer is exactly n the center of the red control circ e. The air bubble should not more than touch the edge of the control c rc e

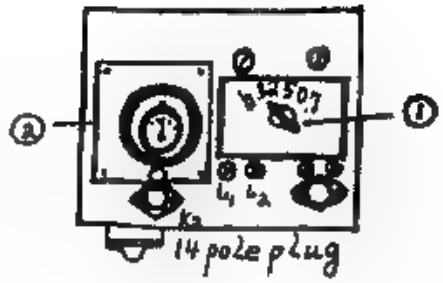


Otherw.se- the ad,ustment device s not set accurately enough
Tighten the swing bolts (2) of the adjustment device well
Recheck the posit on of the air bubble in the clinometer
Should the a r bubble still be located in the center then loosen the three retainer scrws (8) and remove the ad,ustment device from the support
You have hereby ad usted the support

INSTA_LING AND CONNECTING THE J-DEVICE 1/1--3

Install the J-Device
Make sure the ower edge rests upon the rotatable machined strip
Tighten the three reta ner screws
Plug the 20-pole p ugs into their respective sockets

ENGAG NG THE J-DEVICE 1.1 3 FROM THE LAUNCH CONTRO_ CAR



Engag.ng the JG 1/1 3 is a prerequisite for adjusting the cut off speed and testing the adjustment

For th s purpose you wi ut lize the ntegrator testing device ca brator 1, known as JS 1 It is installed .n the center part of the radio controlled desk (FT desk) of the launch contro car You may connect the J-Device only
when the magnet c plugs are inserted n the A-4 and when the launch control
car is being supplied with current

Turn the rotary switch (1) to position O The control lamp L 1 must .ght up after the JG 1/1--3 has operated for 40 seconds You have now turned on the current for the integrator testing device ca brator

The missile mounted JG 1/1--3 is supplied with current by transformer 3 It is connected by turn ng the left rotary switch on the rad o contro desk

Wind the stop watch (2) and when it runs place t .n the compartment with the glass window of the integrator test ng dev ce

Check the time sw tch mechanism See that the impact p n of the electro-magnet is in a state of rest no more than just touching the winding stem crown of the stop watch There shou d be no air gap

Otherwise: the test will not be accurate enough

Place switch (1) for controlling the stop watch on position 1
Depress the button K 2

The mpact pin of the magnet hereby pushes aga nst the w nding stem crown of the stop watch caus.ng it to stop

Again depress the button K 2

The hand of the stop watch hereby jumps to O
Place switch (1) back on the preparatory position O
Wait until the all-clear signal light L 2 shows the test readiness of the JG 1/1--3

ADJUSTING AND TESTING THE CUT-OFF SPEED

You may start testing only after the all-clear signal lights L1 and L2light up

In the launch control car Turn the switch (1) of the integrator testing device calibrator on position 1

In the A-4 Set the range card value of the cut-off speed on the rough-and fine pointed dial of the JG 1/1 3

In the launch control car depress button K 1 until the all clear signal light L2 dies out

This marks the test beginning of JG 1/1--3

The light L3 (preliminary cut-off signal) and L4 (main cut-off signal) light up at an interval of approximately eight seconds

The stop-watch is stopped when light L4 lights up Read off the running time of the stop-watch and compare it with the time given on the range card

In the A-4 Reset the five pointed dial according to the specification on the range card should the two time periods differ

You are then required to test the J-Device again but wait until the all-clear lamp L2 lights up again

See that the two lamps L3 and L4 are properly timed

Should it be necessary adjust the tine pointed dial again and make a third test

Remember. The J Device is ready for operation only if the all clear lamps L1 and L2 are lighted

CONCLUSION

In the launch control car place rotater switch (1) of the integrator testing device on position S

You have completed testing the device only
MORAL: After the two timing elements correspond

The artillery soldier follows the path of the g rl
MOTTO: The A-4 follows the path of the G ude Beam

GJIDEBEAM NSTALLATION ABOARD THE A.RCRAFT

The hunting dog fo .ows the tracks made by game He does not turn to the r.ght or the left of the path

The A-4 follows the path of the Guide Beam It does not turn to the right or left of this path

An electr c path is produced by the Guide Beam ground device It s called the Guide Beam plane

It leads to the objective by way of the launch ng s te

The Guide Beam installat on aboard the aircraft determines whether the A 4 is to the r.ght or left of the Guide Beam p.ane

It causes a deflection which turns the A-4 back on the Guide Beam path

The f ght of the A-4 is therefore much more accurate and the deviation at po nt of .mpact much ess The Guide Beam has no bear ng on the f ring range

Very Important The Gu de Beam method is utilized at on y part of the aunchings and you are to ready the device for operat.on in those cases only

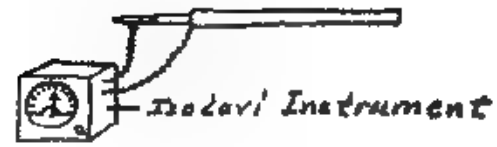
It s your job to test the Guide Beam ground device without operat ng ts transmitter

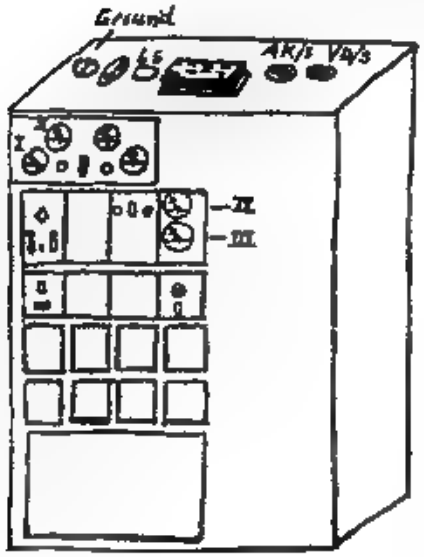
Otherwise: The enemy could get your bearings

You will therefore uti .ze a model transm tter located in the B frame of the test car

DUTIES TO BE PREPARED IN ADVANCE

Check if the test-car is parked approximately 30 to 50 meters from the A-4
Check if the high voltage cable 220 V/50 Hz is laid out from the test car to the current supply trailer and connected to the B-Frame Check if the high frequency cable is laid out from the test car to the A-4 The cable should not be connected or bent





By utilizing the Isolavi-Instrument check the insulation value of the HF (high frequency) cable

It must be higher than 10,000 Ohms

Remember. At a lower value changes the frequency cble

Upon erection of the A-4 fasten the antenna rods to Fin 2 and 4

Connect the HF-cable to the antenna rod of the Fin 2 or 4 and connect the clamp to earth

Measure the drag resistance in the test car with the Pontavi-Instrument

It must be smaller than 10 Ohms

At correct value connect the high frequency cable (H-F) in the test car to the H F connection "L S" at the upper part of the B-Frame

OPERATING THE B-FRAME

The B-Frame in the test car is also utilized for testing the Guide Beam ground device

Here adjustments are to be made in the left fields only

See that switch (8) is in the middle position and switch (6) is to the right

Place switch (1) in an upward position You have hereby turned on 220 Volts

Check if the po nters of the volt meters 1 and 2 are with n the red zone

Remember. At a fluctuation request the proper vo tage from the current supply tra er

OPERAT NG THE MODEL TRANSMITTERS

Check f the HF Transm tter is installed according to the requested frequency

Place sw tch (2) in an upward position

In order to be sure that the model transmitter operates correctly
place switch (3) and (4) downward and switch (5) upward

Then turn knob (10) to the .eft unt l the po.nter of voltmeter III .s on the red line

Check if the pointer of voltmeter IV is n the red zone

Otherwise. the Modeltransm tter is not synchron.zed

The Modeltransm tter transm ts a h gh frequency wave to which ow frequency is super-imposed

In order to obta n good synchronization between high and low frequency p ace switch (4) in upward pos tion

Check if the po.nter of voltmeter III is within the black zone

Remember. At dev at on adjust the torque with screw driver through opening (12)

Place Sw.tch (4) downward aga n

Place Switch (3) upward

Turn Switch (7) to the left and right unt.. you reach the max mum vane deflect on and then return it to the zero pos tion

Remember. At deviation adjust the torque with a screw dr ver through open.ng (11).

If you know nothing about a transmitter
you may easily turn the wrong knob

By testing you will know
MOTTO. Whether or not it is the way it should be

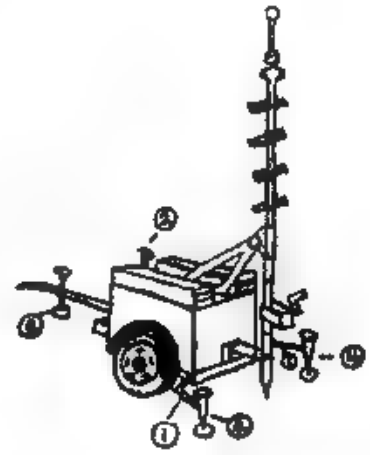
GUIDEBEAM-CONTROLLING APPARATUS

By utiliz ng the compass you know whether you are head ng in the right direction
By utiliz ng the Gu debeam Controlling apparatus you know if the Guidebeam is head ng toward the target

1. You will direct a 25 meter high D polmast, then
2 you will ready the contro ing apparatus, seperat

Very important. Is the fact that only when aunching with Guidebeam will you set up the device

The entire controll ng apparatus plus the D polmast is stored n the trailer
Park the trailer in the designated spot
Set it up so that the tongue of the tra..er heads in the durection of fire



ERECTION OF THE DIPOLMAST

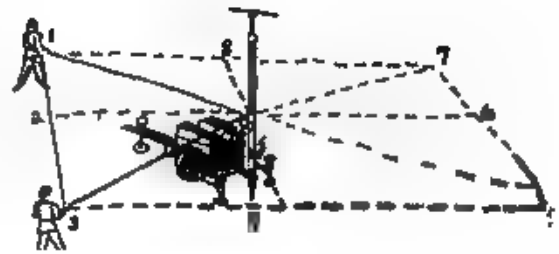
(1) Loosen the retainer bolts of the cantilever bolts Twist the cantilevers toward the outside and backwards and stabilize them by bolts
(2) Loosen the mast support.
(3) Remove the extension tube from the mast into the hor zontal position Insert the extension tube into the bore of the uppermost mast tube, and fasten it w th a c amp By twist ng them to the right Place the Dipolmast Arms to the head of the extension tube
Pull the nner extension tubes of the Dipolarm toward the outside until a marking becomes vis'b e and screw them tight
You have hereby made the correct arm adjustment
Erect the mast hor zontally and lock the back mast support

Remember. When erect ng the mast do not touch the extens on tube
The mast foot should be located directly over the marking

(4) Twist the ground pegs .n such a way that the mast will be hor zontal
The cl nometer on the mast will guide you

BRACING THE MAST

The span ropes are fastened to 8 ground stakes You w arr ve at the required po nts in the following way:



Place the large hook of the measur ng tape over the mast pivot bearing around the mast and roll off the measur ng tape in the same direction the tra er was travelling As soon as the first splice with ring appears one man wi l hold the ring and remain at that particular point You have hereby found point (1). Continue to walk to the left with the measuring tape until the 3rd ring appears This ring will be held by the 3 man

Roll off the rest of the measuring tape in direction of the mast Hook the small hook at the end of the measuring tape into the ring of the large hook

The 3rd man tightens the measuring tape He s standing at point (3), the 2nd r ng is at point (2) Drive in the stakes at point (1) and (3) for the highest and second highest mast bracing
Drive in the ground stake at point (2) for the two .ower bracings

Gu de the measur ng tape around the mast without removing the hook until all 8 points for the ground stakes have been established

Drive in a l ground stakes and unfo d the steps for c imbing the mast

Connect the antenna cable to the plug of the extension tube

P.ace the antenna roll on the unceiled axis

P ace the gray, b ue red and green lab ed span ropes from bottom to top nto their respect ve loops on the telescopic tube

All span ropes are belaid out n a straight line leading toward the ground stakes and hook the guide drum on the stakes

Tighten the 4 lowest guy ropes under the ut.lizat on of the clinometer
Remember. The mast must always be horizontal The rearward cha n must a ways be unhooked
Wind out the mast While do.ng this watch the guy-ropes continously

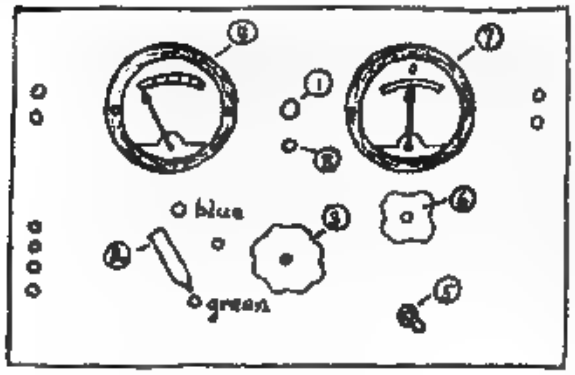
Fasten the guy-ropes to the ground stakes without eaving any slack
Remember. The strength of the mast depends upon just how accurate its horizontal posi.ion is

In normal weather it is possible to wind out the mast without utilization of the guy ropes
Shou d you wind out the mast in strong wind then whatever side is exposed to the w nd must be corrected by utiliz ng the respective guy ropes The mast s horizontal if the bracing s correct

PREPAR NG THE CONTROLL NG APPARATJS

Check if the HF Amplifier and the Ultra-h gh Frequency receiver is nsta ed according to the ordered frequency Connect the end of the HF-Antenna cable to the Ampl fier in et
Check if the HF Cable of the HF Amplifier s connected to the Ultra-high frequency receiver Connect the FF-Cable to the respective coupling You have hereby made a connection between the Guidebeam-Ground device and the Guidebeam Controlling apparatus Check if the battery s connected

By depressing the operating button (1) connect the Transformer b ue
OPERATING THE CONTROLLING APPARATJS to the contro ling apparatus Turn the stage selector Switch (2) on blue Regulate the battery voltage for the Transformer w th the Regulator (3) The pointers of the Measur ng dev ce (3) must be in the b ack zone After 5 minutes turn the Stage Se ector Switch (2) on red The pointer on the Measur ng device (4) must be in the b ack zone



Otherw se--The Ultra high Frequency Amplifier will not have the correct one voltage potential Turn the Stage Selector Switch (2) on green The pointer on the Measuring device (4) must be in the black zone

Otherwise--The HF-Amplif er will not have the correct anode-voltage potential
Place the Transformer (5) on " oop-test" Turn Knob (6) to the left and to the right Watch the Measuring device (7) Its pointer must travel beyond the entire scale area By utilizing Button (6) you check to see if the FF-Cab e is connected with the Transmitter of the Gu debeam apparatus Check by phone if the Measuring device (12) shows a dev ation (see Page148)
Place transformer (5) on "measure"
Remember: Do not eave Transformer (3) on "loop test" for a longer period of time

Otherwise You run the battery down for no reason
Depress Button (8)
You have hereby disconnected the contro ling apparatus

MORAL If a i goes we at checking time Your miss e wi l fly correctly

The Rifleman loads his weapon and waits for the order "Fire"

It is not that easy with the A-4.

The Launching Platoon readies the A-4 for the Takeoff Current produced

in the current supp y trailer and led to the device by way of Cables is

needed for this purpose

Funct oning is controlled by electric Devices located on three desks in

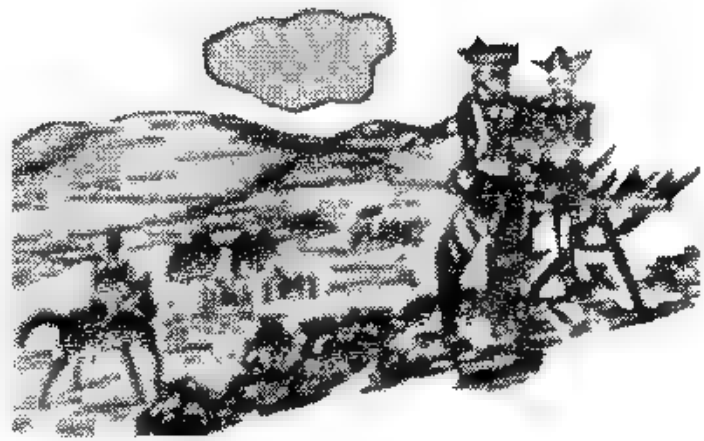
the Launch Control Car. To operate these desks is your business

For launching you will only turn one switch

Remember, however when you do this you release a force of 25 tons

Thanks to moto vehicles, chang ng
MOTTO A position has finally become a joy

Two hundred years ago a General, who led his troops into battle, stood on top of a hill, which gave him a good view of the battleground. By watching the fighting he was able to determine the statue of the battle Messengers on horseback delivered his orders



With the A-4 it is not poss ble to determine the working order of the numerous devices by simply watching them At the launching nstallat on you therefore need special vehicles equipped with specia instruments n order to prepare and test the A-4 for launching Orders are transmitted by cable

The following makes up a launching installation

1 Launch ng control car

1 Test car

1 Current supply trailer

You are to drive these vehicles on to the aunching site and operate them
Park them as ordered

Remember You must have a clear view from the launch contro car to the launching platform

In the Launch control car is ocated the technical Command Control Station at the aunching site

In the Test Car certa n instruments are installed enabling you to test the radio devices of the A-4 prior to takeoff How this is done is shown on Page 69 to 72 Protect the dev ce from dust and dampness

In the Current Supply trailer 220/380 V Polyphase current and 27 V Direct current are produced In addition you are also supplied with Battery voltage

Move up fast and camofiage well
MORAL: Otherwise you will soon be bombed

It is a well known fact that laying a cable
MOTTO. Is connected with movement

LAYING THE CABLE

As soon as the launch control and test vehicles are set up in the launching site, you are to connect the cables
Remember your buddies at the A-4 are unable to continue until current flows through the cable

PRIOR TO LAYING THE CABLE

Assemble the cable car. The chassis is stored at the rear wall the wheels at the outside wall of the current supply trailer.
Take the cable drums from the cable trailer of the current supply trailer Additional cable drums may be found inside the current supply trailer

LAYING THE CABLE

Take into consideration that the cables must be protected
Wherever vehicles cross the cable you must
either bury the cable, or
cover the cable with planks
Protect the fittings from dirt and dampness
Each cable carries a number and a marker at the end The sockets carry the same numbers
The marker tells you where to connect the cable Pay attention to the numbers and the markers when making the connections

Otherwise, you will cause a short circuit

Connect the following equipment between each current supply trailer and its respective long range Rocket Carrier

Two 60 m anti-aircraft cable 108 X 0 5^2
One 60 m NSH-Cable 21 X 1 5^2
One 60 m NSH-Cable 4 X 16^2.

Count the following equipment between each current supply trailer and its respective launching platform

One 70 m NSH-Cable 21 X 1 5^2

Connect the following equipment between each current supply trailer and its respective launch control car

One 120 m anti-aircraft cable 108 X 0 5² and
one 120 m NMH Cable 4 X 4²

From each test car the following is connected to the respective power set
one 70 m NSH Cable 21 X 1 52 and
one 70 m NSH Cable 4 X 2 52
to each launching platform
one HF Cable

COMMUNICATION CABLES

You will also see to it that there is a means of communication between the individual launching sites You must therefore hook up telephone wires. You will find them in the cable drum and current supply trailer

From the launching site connect
two 180 m FF-Cables to the respective launch control car

From the current supply trailer connect
one 70 m SF Cable to the respective long range rocket carrier

From the test wagon connect
one 40 m SF-Cable to the respective long range rocket carrier
You will find the 40 m SF-Cable in the test cars
70 m SF-Cable in the individual current supply trailer

As soon as the test cars are properly parked and set for operation you must reconnect them by utilizing a 150 m SF-Cable, but this time you connect it with the launch control car

Should the Guidebeam be used for launching then reconnect
one 500 m FF-Cable from the launch control car to the Guidebeam control device

Should an emergency arise due to a damaged FF-Cable you may substitute a normal 250 m cable obtainable from any Signal outfit

Remember. Under no circumstance are you to utilize Pupincon.

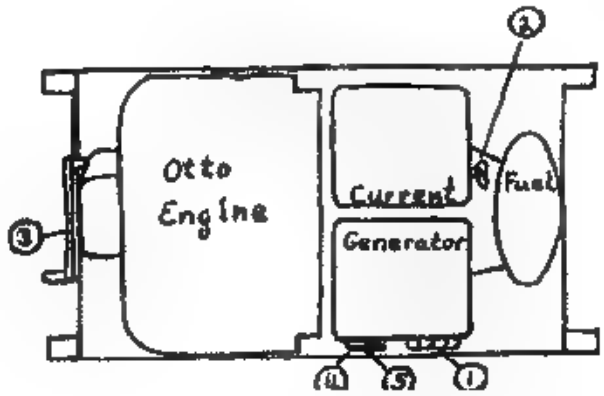
Otherwise:--Your communication system will fail.

When laying your cable protect
MOTTO: your fittings from dirt and dampness

MOTTO Everybody agrees that it is a fine thing
to be able to produce your own electricity

THE CURRENT SUPPLY TRAILER

The current supply trailer harbors an auto-engine that actuates a polyphase current generator of 220/380 Volts
After receiving the order you will immediately start up the generator set



(1) See that the line is connected
(2) Ground the generator. The red-wing nut at the foot of the generator underneath the fuel tank is the earth clamp
(3) Turn on the auto-motor. As soon as it runs place the ignition switch of the auto-motor on "operate"
(4) Set the voltage by turning the hand regulator of the switch-box without placing a stress upon the generator. At a stress you are not allowed to make a re-adjustment
(5) Turn on the main switch at the switch box Your generator will then produce current

DISCONNECTING

Turn the carburator throttle lever on idling
Turn off the main switch located on the switch box
Depress the stop button on the front side of the auto motor until the motor stops
Do not forget to turn off the fuel tap

CHECKING THE CONTROLS

After receiving the order turn the pole of the cut-off signal modulator battery "on" or as the case may be "off"

Should the meter not be running
MORAL The lamp will not be lit

MOTTO This vehicle is protected with armor and is the switch-control station for the launching site

INSIDE THE LAUNCH CONTROL CAR

Should you be stationed in the launch control car, then you are in the technical command control station of the launching site

Never forget this when working there
The most important things in the launch control car are the three control desks viz.

The propulsion control desk

The piloting desk

The radio control desk

The X-time plan gives you the switching sequence of the individual desks and how they work into each other

Your job is as follows

THE PROPULSION CONTROL DESK

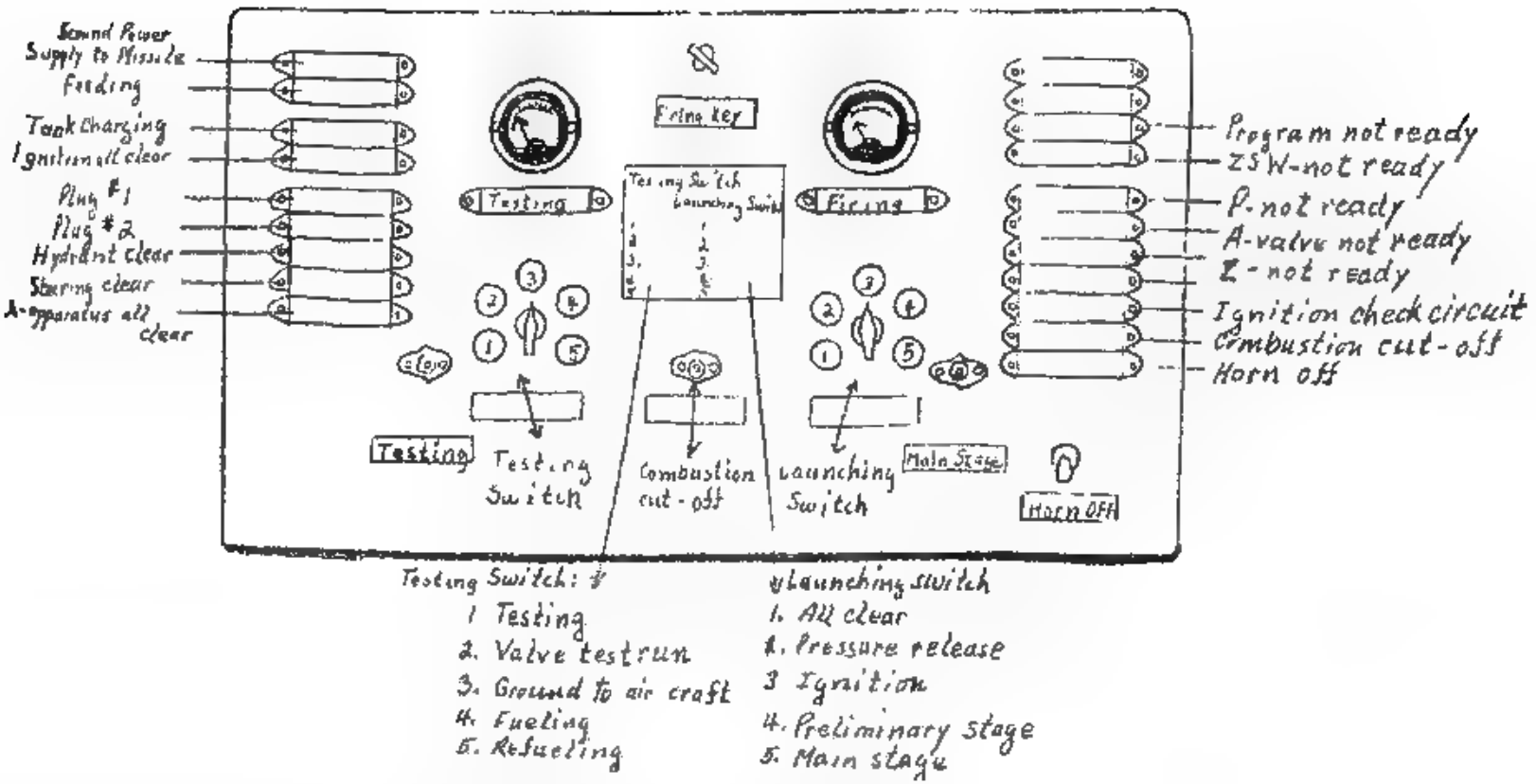
It is utilized for watching over propulsion and launching

After receiving the order ready yourself for propulsion control testing

From the Launching Platoon Leader

You will insert the firing key and turn it on "testing"

Check if the condition signal lights for "testing" "ground power supply", "Plug I" and "Plug II" are lit



Put the testing switch on position No 1 (testing)
Depress the button "testing"
Watch the lightening up of Signal lamp No 1 at the testing switch
Should a "not ready" lamp light up, then report it to your platoon leader
Now report "Ready for propulsion unit testing "

To the Order

1. Switch the launching valve to the Posit on 1--"all claer"
   Watch the l ghting of the "all clear" signa light 1 on the launching valves
2. Switch the launch.ng valve to Position 2--"pressure Re.ease"
   Check f the condition signal light "Tank pressurizing" is t and f it goes alternately on and off
   Watch the lighting up of the "all clear" s gnal light 2 on the launching valve
3. Switch the launching valve on position 3--,gnition
   Check if the condit on signal light "Ignition clear" goes off
   Chek the lighting of the signal light 3 on the launching valve
4. Sw.tch the launching valve on Position 4--Primer
   Check the lighting up of the signal light 4 on the launching valve
5. Turn off all switches
   Remove the firing key
   Turn the firing key back on Position 1

After the launching platoon leader gives the order
Ready for "ground to a rcraft testing".
nsert the firing key and let it stay on "testing"
Check if the condition s.gnal lights ight up on "test ng", "gorund power supp.y" "Plug I" and "P ug II"
P ace the testing switch on Position 3 (ground to aircraft testing)
Report: "Prepared for ground to aircraft testing"
Depress the test switch after receiving the order to do so
Check if the "ground power supply" light goes off and the "aircraft power supply" goes on
After receiving the order "Turn off all switches" you will p ace the test switch back in its o d position and remove the test key

Prepare for the ma.n test run
Insert the ignition key and turn it on "launching"
"Hydrant clear", "Steering clear" and J-Device l ght up
Report "Ready for main test run"

After receiving the order:

1 Turn the launching valve on Position 1--Clear
Watch the lighting of the "a clear" signal light 1 on the aunching valve

2 Turn the launching valve on Position 2--Pressure Release
Check if the condit on signal light "Tank Pressurizat.on" lights up and then goes off again
Check if the condition signal light "all clear" lights up.
Check the lighting up of signal light 2 on the launching valve

3 Switch the launching valve on Posit.on 3-- gnition
Check if the condition light "Ignit.on clear" goes off
Check if the light "Ground power supply" goes off and then the light "A rcraft power supply" goes on
Check the lighting up of s'gnal light 3 on the launching valve

4 Switch the launching valve on position 4--Primer
Check the lighting up of signal light 4 on the launching valve

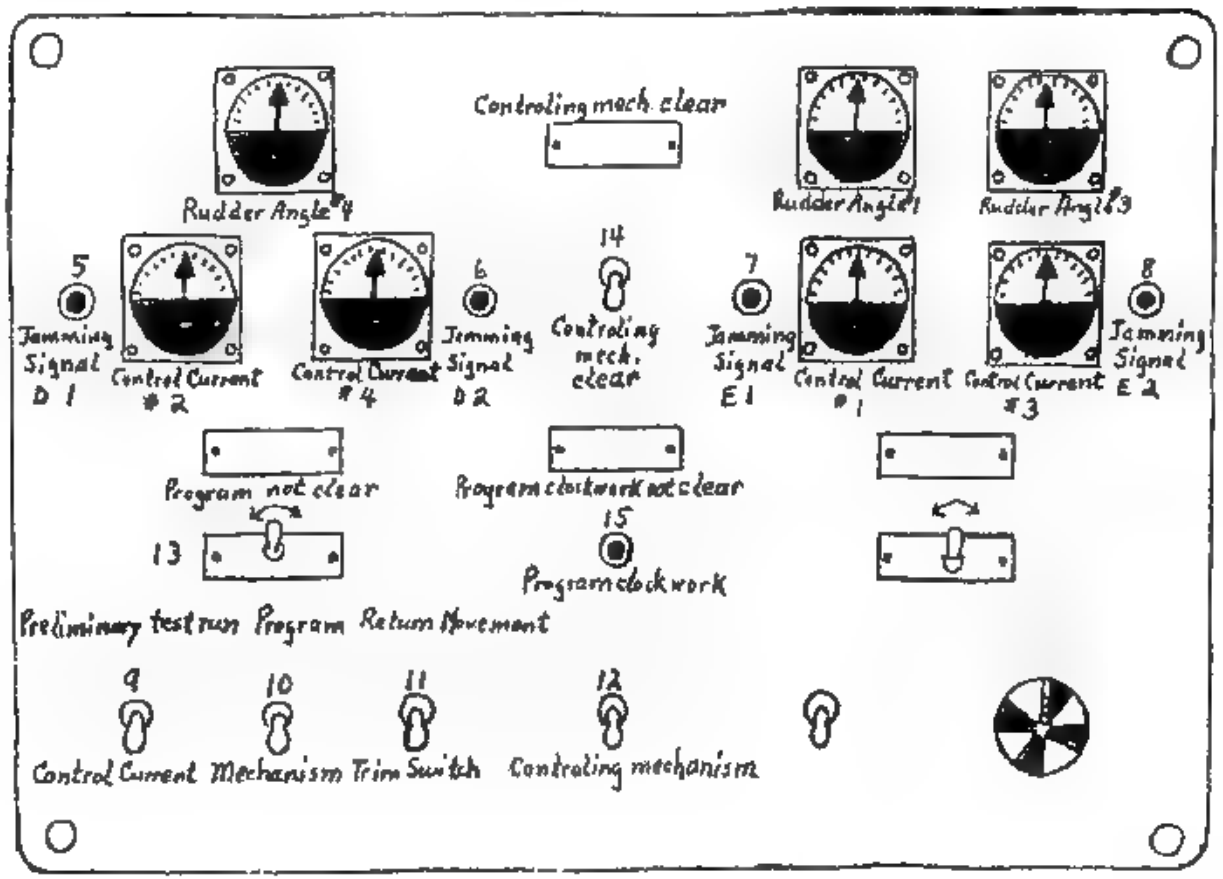
5 Sw.tch the aunching va.ve on Pos.tion 5 Main Stage Depress the lever "Ma.n Stage"
Check if the condition signal lights "Plug " and "Plug II" go off

6 Turn off all sw.tches--Remove the ign t.on key--Turn the launch ng valve back on Position I.

After receiving the order "Prepare for Fue ing"
Insert the firing key and turn it into the Position "Testing"
Check the cond t.on s gnal lights "Test ng" "Ground Power Supply" "Plug I" and "Plug II" w light up
P ace the test ng switch on Posit on 5
After receiving the order, you will depress the ever marked "Test ng"
nform the launching platoon leader as soon as lamp A lights up.
After receiving the order turn off all sw tches
Place the test switch into its original position and pu the .gn t.on key

LAUNCH NG

After receiv ng the order you will follow the same proced ngs you did in the "Ma n Test Run"
Check in addition if the control lamp A lights up at Position 1
Wa.t at Position 2 until the lamp goes off


Controling mech. clear
Rudder Angle #4
Rudder Angle #1
Rudder Angle #3
5
Jamming Signal D 1
Control Current #2
Control Current #4
6
Jamming Signal D 2
14
Controling mech. clear
7
Jamming Signal E 1
Control Current #1
Control Current #3
8
Jamming Signal E 2
Program not clear
Program clockwork not clear
13
15
Program clockwork
Preliminary test run
Program
Return Movement
9
10
11
12
Control Current
Mechanism
Trim Switch
Controling mechanism

THE CONTROL DESK

It is used for the following 1 In order to clear the controls 2 In order to test the Guide-Beam installation aboard the aircraft

CLEARING THE CONTROLS

In order to check the steering the ground voltage must be connected and the A 4 must be in a horizontal position

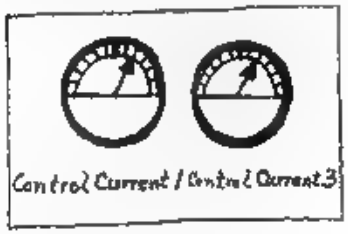
Adjusting the controls

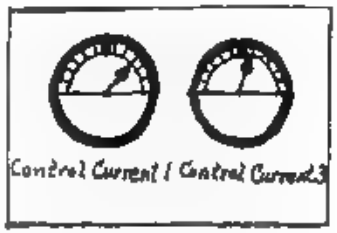
Turn on Switch (9) and (12) Switch (12) starts the Transformer 1 and 2
Check if Ammeter 1 2, 3 and 4 show different values and turn on Switch (10) Ammeter 2 and 4 must operate on the same movement Then turn off Switch (10)

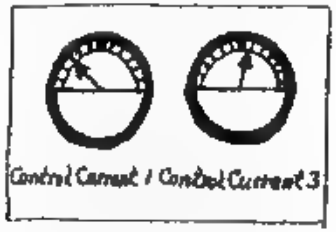
Give the following order to the current trailer "Disconnect Course Gyro Battery!"
The pointer position 1 to 4 will now change somewhat

Give the following order to the Launching Site Rectify control current 1 "
Give the order "Stop!" as soon as the control current matches the value zero
Do the same for control currents 2, 3 and 4

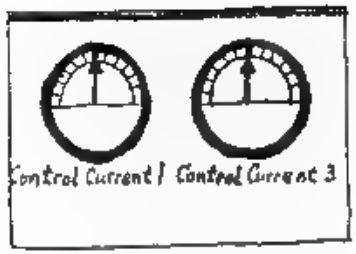
Give the order "Connect the Course Gyro Battery!" to the current supply trailer
Should the control current 2 and 4 not be zero, then give the order Adjust Horizon!" to the Launching Site or (working platform)
Give the order "Stop!" as soon as the control current 2 and 4 is on zero
Should control current 1 and 3 not have the same pointer position or not be on zero then give the order "Adjust roll and yaw gyro "

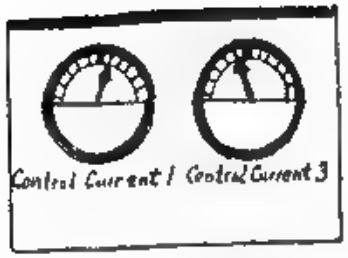


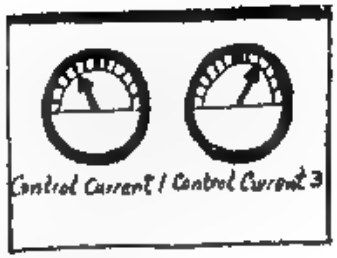




Give the order "Stop " as soon as control current 1 and 3 show the same pointer position







Aga n you must rectify control current 1 and 3, should they be larger than O, but smaller than 4 and A
Should the control current 1 and 3 be over 4 and A, then you must interchange the rol and yaw gyro

SERVO MOTORS AND SYNCHRONIZATION

Turn on Switch (10)
Give the order "Check synchronization of Rudder 2 and 4"

Depress interference Button (5) (D1)
Check if Ammeter 2 and 4 show the same pointer movement to the Left

Depress interference Button (6) (D 2)
Check if Ammeter 2 and 4 show the same pointer movement to the Right

Depress interference Button (7) (E 1)
Check if Ammeter 1 and 3 show the same po nter movement to the Left and if m ssile ang e Meter 1 and 3 go to the Left end position equally fast

Depress interference Button (8) (E 2)
Check if Ammeter 1 and 3 show the same pointer movement to the Right and if missile ang e Meter 1 and 3 go to the Right end pos tion equally fast

n order to check synchron zation of col aborating servo motors g.ve interference signals to the Right and to the Left with short t me interva s

Check f the missile angle Meters 1 and 3 show the same speed of movement
Should this not be the case give the order "Rectify Potentiometer of Rudder 1 and 3!"

TESTING THE PROGRAM

Make Rudder 2 and 4 deflect toward Fin 3
Check if missile angle Meter 4 makes a movement to the Left

Turn Transformer (13) to the Left and count aloud 21 22 23, 24
The indicator "Program not clear" must light up

After 4 seconds the Ammeter and Missile Angle Meter 2 and 4 must go to the Right
Turn off Switch (10)

Place Transformer (13) to the Right and 3 seconds later place it on the middle position
After 2 minutes the indicator "Program not clear" must go off

TESTING THE TRIM STEERING

Turn on Switch (10) and (11)

Give the order "Correct the deviation of Rudder 1 and 3!" and then check the path of the Trim Tabs 2 and 4
Missile angle Meter 1 and 3 must show a contra-deflection

After you have reported "Trim Tabs run correctly!"
Turn off Switch (11)
After reporting "Trim Tabs reverse correctly!" check if the two indicators "Program not clear" and "Contact Timer not clear" have died out then make the report "Controls clear" to the officer in charge
Turn on Switch (14)

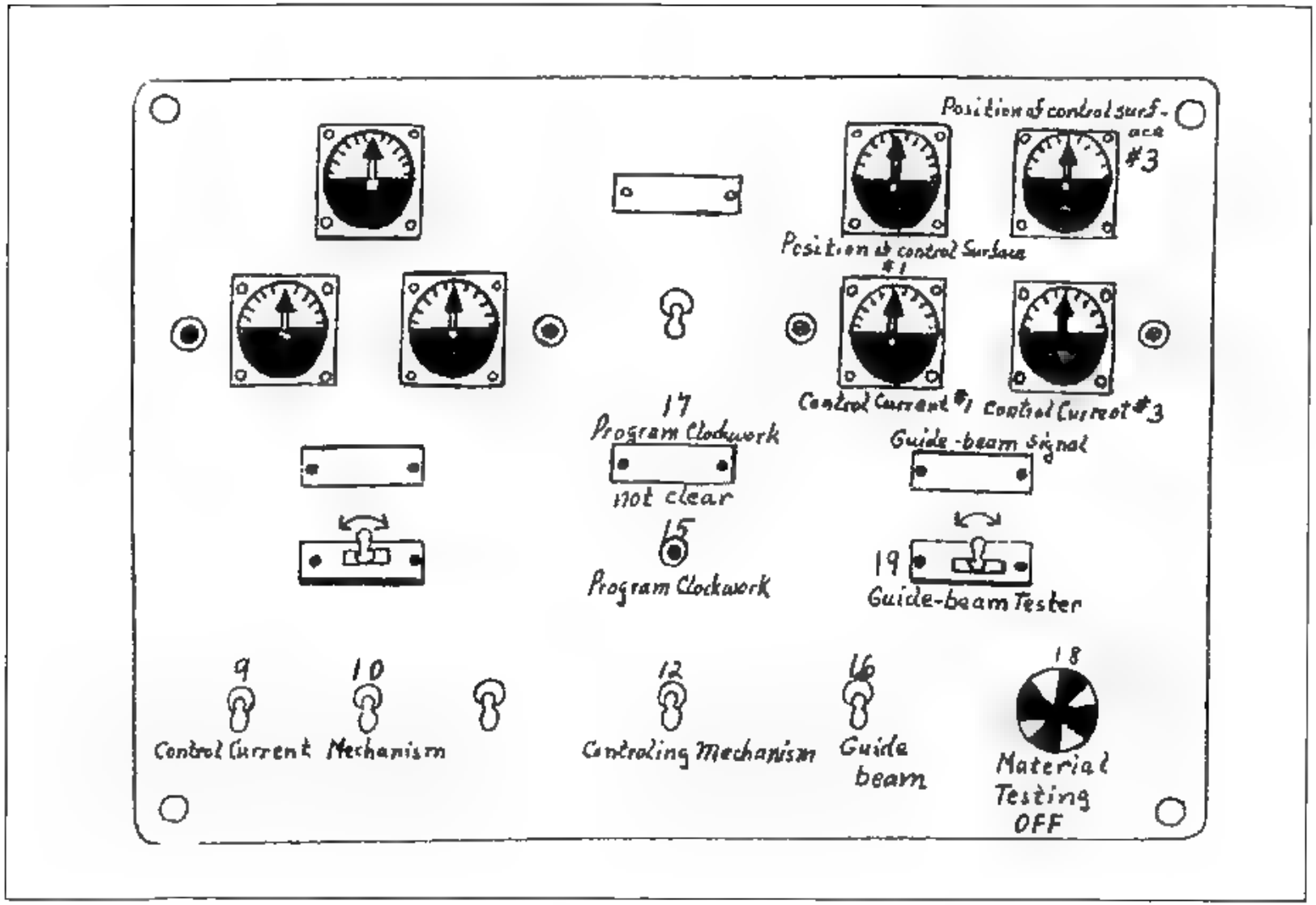
THE STEERING MECHANISM

The steering mechanism is disconnected only if, for special reason, a longer interval prior to the main test run should be necessary
Turn off Switches (1), (10) and (12)

KEEPING THE SERVO MOTORS WARM

This is necessary only in very cold weather under 5^{0} outside temperature
At regular intervals turn on Switch (10), after 3 to 5 minute turn it off again

Otherwise--the oil will become thick


Position of control surface #3
Position of control Surface #1
Control Current #1
Control Current #3
17
Program Clockwork
not clear
Guide-beam signal
15
Program Clockwork
19
Guide-beam Tester
9
Control Current
10
Mechanism
12
Controling Mechanism
16
Guide beam
18
Material Testing OFF

THE MAIN TEST RUN

Should the steer ng mechanism become disconnect
Turn on Switch (9) and (12)
The gyros start up the Control current osc ates and then goes direct y on zero f necessary turn on Sw tch (10) for a short time
As soon as all Contro currents are zero and you are sure that the ndicators "Program not c ear" and "Contact T mer not clear" do not l ght up, you will report to the Battery officer "Steer ng Mechan sm clear for main test run"
The still detectable small false currents must keep their course
Upon receiving the order "Take off"
Watch Ammeter 2 and 4 After 4 seconds they are to go off to the Right

D sconnecting the control switches

Turn off Switches (9) (10) and (12)
After inserting the Magnetic p ugs turn Transformer (13) to the r ght for a short period of time and depress Button (15) ZSW for a few seconds
After approximately 1 m nute the Indicator "Program not clear" w ll die out It s followed by the ind cator ZSW not clear". (After 2 1/2 minutes)

Keep ng the Servo Motors Warm

Turn on Switch (10) at regu ar time intervals After 3 to 5 m nutes turn the switch off
In co d weatherth s is done immediately after fueling with A substance, in warm weather f l up with A-substance first

CLEARING PRIOR TO LAUNCH NG

Takes place after fueling and erection, as we as turning the A-4 in the direct on of fire.
Turn on Switch (9) and (12)
Wait 3 m nutes
Watch the Control currents
Should it be necessary, rect fy them again

TESTING THE GUIDE BEAM-APPARATUS ABOARD THE AIRCRAFT

Putting Into Operation
Place Switch (9), (12) and (16) to the top
The indicator (17) "ZSW not clear" should not light

Otherwise--the contact timer will not be in the zero position

Indicator (18) "Data Transformer" must light up

No signal will get to the control amplifier

Remember If indicator (17) "ZSW not clear" lights up depress Button 15 approximately 18 Seconds
Indicator (17) must then die out after 1 1 2 Minutes and Indicator (18) must light up

TESTING THE CONTACT TIMER

Depress Button (15) for approximately 8 Seconds
Indicator (17) must light up
Indicator (18) will die out

Otherwise no signals will be transmitted from the Guide Beam Device

Testing the Guide Beam Signals

Place Switch (19) "Guide Beam Tester" on the middle position
Control currents 1 and 3 may amount to + 10 mA

Remember Oscillation of control current is permissible
Turn Switch (19) to the right
The control current measuring device 1 and 3 must first deflect strongly to the right then return to just a partial deflection.
Place Switch (10) "Transmission" to the top.
Otherwise -the Rudders will not be able to move out in accordance
with the control current

See if the "Position Indicator" 1 and 3 deflect to the right.

Place Switch (19) to the left

The Control Current Measuring Device 1 and 3 must deflect strongly to the left and then return toonly a partial deflection

See if Position Indicators 1 and 3 deflect to the left

Place Switch (10) to the botton

Depress Button (15) ZSW approximately 10 Seconds
The Control Current Measuring Device 1 and 3 must slowly continue to deflect to the left

Otherwise--the A-4 will not steer correctly at a cross wind

After 1 1/2 Minutes the Transperancy must die out and Indicator (18) must light up
Check if the Control Current Measuring Device 1 and 3 return to zero

Otherwise--the Signal Mixing Motor and the Measuring Data-Transformer did not return to zero

Place Switch (19) in Middle Position
Depress Button (15) approximately 18 Seconds
Transperency (17) must light up and Indicator (18) die out
The Control Current Measuring Device 1 and 3 may show an average of 25 mA at the most

Otherwise--you will be forced to interchange the Guide Beam Device aboard the aircraft

After 1 1/2 Minutes Transperency (17) must die our and Indicator (18) light up

The Control Measuring Device 1 and 3 must return to zero

AFTER COMPLETTING THE TESTS

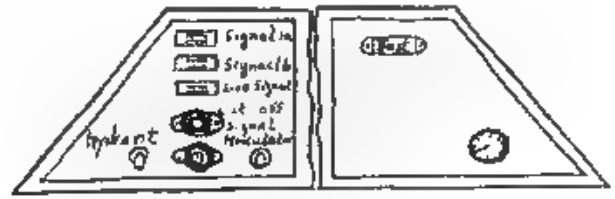
Place all Switches on the Control Desk in a downward position

MORAL Once you are finshed with testing the Guide Beam the next step will be to study combust on cut-off

RADIO CONTROL DESK

The Radio Control Desk is utilized for testing the Combustion Cut-off Device that is either the Frequency Dopplers and Cut-off Signal-Receivers, if combustion cutoff is given via radio, or the J-Device The integrator Testing Device Calibrator JS 1, located in the center part of the radio control desk is utilized for testing the J Device 1/1--3

Page 75 will tell you how this center part looks and how you are to operate it



The right and left part of the Radio Control Desk is utilized for connecting the Frequency Doppler and testing the Cut-off Signal Receiver

ENGAGING THE FREQUENCY DOPPLER

The test may begin as soon as the Magnetic Plugs are connected

When given the go ahead connect transformer No 3 in the A-4 by engaging tumbler switch (1) "Hydrant"

TESTING THE CUT-OFF SIGNAL-RECEIVERS

The magnetic plugs must also be connected for this test

Contact the test car by phone and give the following order

1. Turn the Switch in Field III (Transmitter red) on "in".
2. Turn the Switch in Field II on "in".
3. Turn the switch in Field 22 (Cut-off Signal Modulator) on "in"

Wait 1 Minute until the Apparatus has warmed up.

a) Unarmed Test

Turn on Tumbler Switch (1) "Hydrant" Transformer 3 will start up Wa t 1 to 2 m nutes Depress the "Cut-off Signal Modulator" push button

After a short time the following must appear

1. Shutter Enunciator Signa 1a-(Preliminary cut-off signa.)
2 After approx 3 seconds Shutter Enunciator Signal 1b (Main cut-off signal)

b) Armed Test

Depress both push buttons "cut-off s gna modu ator" and "Armed Signal" simitaneously The following must appear

1. Shutter Eununc ator Signal 1a It stops
2 After approx 3 seconds shutter enunc ator "s gna 1b" and shutter enunciator "signal armed" At the Propulsion Unit Control Desk the indicator "Combustion Cut-off" must l ght up At th s time the siren must start up

Remember Shou d you get interference from the Cut off Signal Receiver, then do not permit the transformer to be connected for more than 15 m nutes

Should everything be all r ght report "Combustion Cut-off clear"

Turn all Switches on "off"

MA N TEST RUN

F.ve minutes prior to Test Beg'n turn on Tumbler Switch (1) again

After receiv ng the order "Combustion Cut-off" depress the two push buttons "Cut-off Signa Mosulator" and "Live S gnal" located on the radio control desk You have hereby by way of the HF Cable 4 transm tted the modulated energy of the test transmitter to the cut-off Signa Receiver

The ndicator Receiver 1a S gnai 1b and Live Signal must appear in the same sequence as shown in the paragraph "Live Test"

After a flawless test reoprt

"Combustion cut-off Device aboard aircraft ready for Launching"

After completing the test turn Tumble Switch (1) on "off"

LAUNCH NG

Turn on Tumble Sw tch "Hydrant".

"Main Stage--everybody is wa ting to see if the A-4 starts up correctly.

MORAL:

Even though a job seams sma and minor
MOTTO It is very important for effect veness

NOSEPIECE OF THE FUSE

The Elephant utilzes his trunk as a Sense of Touch
By utilizat on of ts Nosepiece the A 4 wil know,
when it touches the Ground
It burts nto thousands of p eces
the Exp os ve Charge explodes

The Nosepiece of the A 4 harbors the fuse upon impact it must
gn te the exp os ve charge in ess than a thousandth of a second

Otherwise--the A-4 wou d be driven deep into the ground

How s the Fuse armed?
Screwing in the Fuse does not arm it
During testing of the Power Plant it rema ns unarmed
Noth ng therefore can happen
The Fuse s armed in three Steps and this s on y after launching of the A 4

Arm.ng the Fuse takes p.ace automat.ce.y during f.ight.

After rece v ng the order place the Commun cat on Apparatus plug nto he Sterg (code for a type of fuse arming un t in Gu ded Miss les) which delivers the gn tion vo tage Connect on to the Sterg can be made through lll of the nstrument Compartment

After rece ving the order remove the covers from the two fuse Connection Plugs and p ace the p ugs nto the Fuse Sockets

The Commun cat on Apparatus plugs as we as the covers for the Fuse Connect on Plugs are sealed
Remove the sea s on y pr or to making your connection

MORAL The engineer took a w se precaution
The fuse is armed after launching

The A-4 derives the Power needed for Flying from the Fuel

Over 8000 liters of Fuel must be filled into the A-4 prior to Launch ng

You will haul the Fuel in Tank Trucks from the supply points to the aunching site

There you will fuel the A-4

Hand e the Fuel with care and abide by the Safety-Regulat ons

or not it is possible to accomplish
MOTTO. something great depends on the fuel.

THE FUEL

In order for the A-4 to perform such a long flight, you will
fill it with four Liquid Fuels
It will take a terrific Amount until it is filled up
Each A-4 must have over 8000 liters
Some fuels have a complicated chemical Name
We will therefore name them

A-Substance
B-Substance
T Substance
Z-Substance

You can remember them easily
The gas of combustion is produced from the A-Substance and B-Substance
Steam is produced in the generating plant by the T Substance and Z Substance
What special precautions do you have to take when working with various Fuels?

A-SUBSTANCE

Color pale blue.

A-Substance is very cols (-183^0 C) It changes dampness to ice

Therefore All pipe lines must be dry

Otherwise they will freeze

Thawing with warm water or hot air brings about a loss of time
The coldness of the A-Substance acts like Fire Should A-Substance get on your skin it will cause blistering

Therefore Wear at least a pair of Gloves made of Asbestos

If possible wear complete protective clothing

A Substance Steam is also very cold

Therefore. Wear warm Shoes should it be necessary for you to
stand in A-Substance for a long period of time

Burnab e material saturated w th A-Substance wil ignite immediately by one single spark

Therefore: Do not smoke! Do not use an open fire or open light!

O l and fatty substance ignite spontaneously when mixed w th A-Substance

Therefore, Do not use oil or fatty substances!

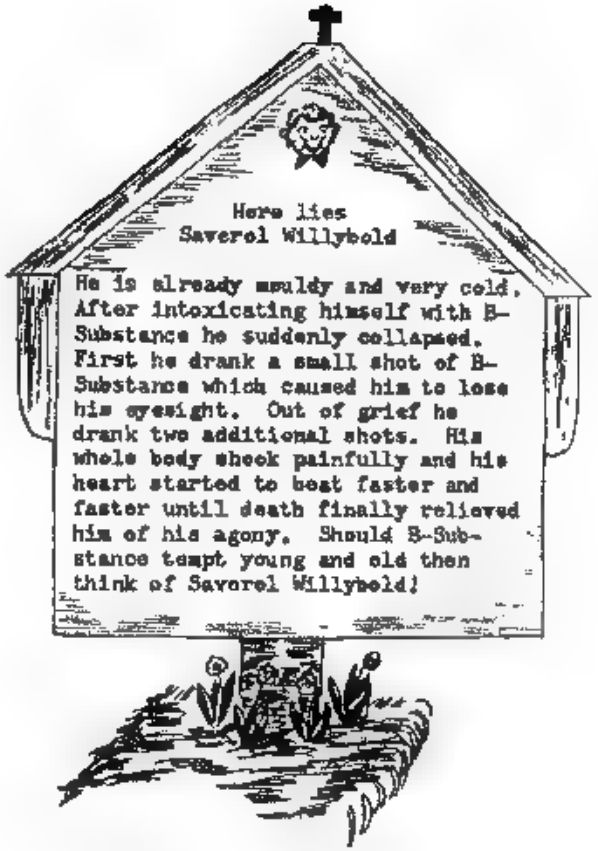
A-Substance evaporates continuously

Therefore' A-Substance conta ners must be open

Otherwise--they will explode

Speed up your A-Substance transports!

Otherwise--you wil arive with empty conta ners



B Substance

Color blue or violet

Just like ink

B-Substance is very poisenous One shot glass w l bl nd you four shot glasses will kill you

Therefore Do not dr nk one drop of B Substance

B-Substance is very inflammable!

Therefore Do not smoke! No open fire or open light!

B-Substance should not be mixed with A-Substance and T-Substance!

Otherw.se--there w l be danger of fire and exp osion

T Substance

Color from color ess to a slight yellow

T Substance eats up your skin and ignites your cloth ng Be on the lookout for any contact w th the T-Substance

Therefore Wear protective clothing made of Mipo.am (a type of synthetic rubber) Do not forget your safety gogg.es

Otherwise--you will contact b isters or burns

Otherwise--you will contact blisters or burns

Keep water handy in order to wash off areas contaminated with T-Substance. The water tank ocated on the T-Substance Oil Tank Truck holds 300 Liters

T Substance affects metals also

Therefore. Utilize containers made of glass or aluminum only

T Substance decomposes continuously and gives off a gas This happens especially when contam nated w th outside matter.

Therefore Cover all containers well Keep hoses and mountings clean

The gas however must be able to emerge

Otherwise the conta ner will burst!

When T-Substance decomposes heat is produced

Therefore. Check the temperature of the containers regu arly by touching them

T-Substance crystallizes at -19^0 C

Therefore. Heat in cold weather w th T-Substance-Preheater!

T-Substance must have a concentration of at least 78 4%

Otherwise the steam temperature will drop and the thrust of the A-4 will not be large enough

Therefore Check the specific we ght by submerging an aeria meter Read off the temperature and derive the concentration from a chart

Put out T-Substance fires with water only and never use the Tetra-Fire-Extinguisher on the truck

Otherwise--you will increase the danger

A minor thing has often caused an explosion

Z SUBSTANCE

Z-Substance looks s milar to blueberry soup It is a deep dark vio et color

Z-Substance eats up your skin

Therefore Wear the same protective clothing as you do when work ng w th T-Substance

Z Substance crysta.lizes easily

Therefore Always preheat the container of Z-Substance with the electric heating dev ce

Prior to preheating open the ock of the container

Otherwise--it might hit you in the face

Z-Substance should not be m xed with T-Substance

Therefore Always store Z-Substance and T-Substance separately

Never transport the two substances on the same vehicle

Never use the same container for storing MORAL Fuel often causes grief

Otherwise-- there will be an explosion Even if you believe it to

be stored properly

It is your advantage to keep your
MOTTO "Eyes open" especially during fueling

FUELING OPERATION

1- You will haul the fuel from the depot. You will fill the A-Substance, B-Substance and T-Substance in the tank truck Z_Substance is transported in cans from the field supply depot
2 You will drive the tank truck to the launching site
3. You will fill the A-4 with fuel at the launching site The trailer and propulsion unit crew will assist you

B-SUBSTANCE

The container KW is utilized for transporting B-Substance from the supply depot to the launching site

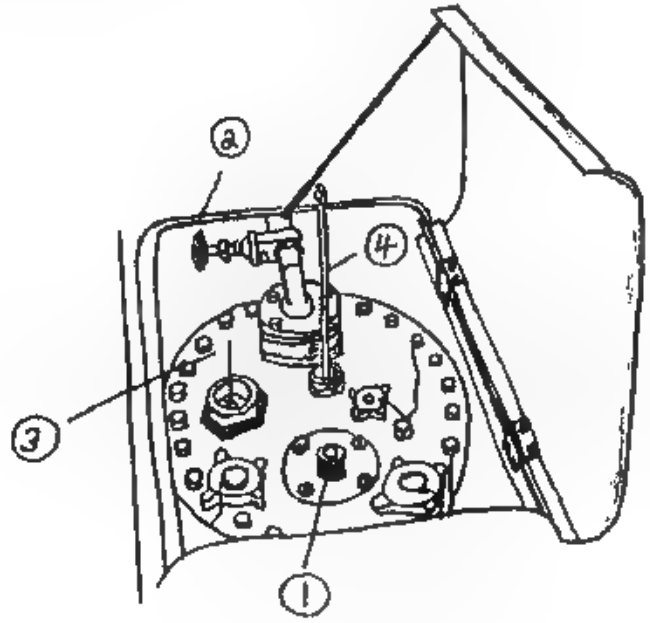
FILLING THE CONTAINER KW

You may fill up the B-Substance container
1. through the filler cap at the manhole cover
2. through the drain plug at the instrument compartment

The instrument compartment is located at the rear of the truck

Remember: Prior to the filling.
Unwind the screw-cap of the filler plug (1)
Connect the filler hose
After filling.
disconnect the filler hose and screw on the screw-cap

Remember. The pressurizing and pressure release valve (2) located inside the manhole cover must be open at all times



1. Fueling through the filler plug

Turn the fourstage faucet in the instrument compartment on A or C; now you may start with fueling

POSITION OF THE VALVES AT FUELING AND DRAINING OF B-SUBSTANCE

Open the valve — Close the valve

The number will give you the sequence

	Process	Tank-Truck			Motor-Pumping Device			
		Drainage Plug	Four-way faucet	Cut-out gov. valve	Three-way faucet	Cut-out governor valve		
						1,2	3	4
Filling the truck	1. Case. Through Filling Sleeve		A or C (2)					
	After filling							
	2. Case. Through drain plug							
	A. Motor pump		B (6)		B (4)			
	After filling		A or C (3)					
	B. Hand lever pump		C (2)					
	After filling		A (1)					
Draining the truck	A. Motor Pump		B (5)		B (3)			
	After drainning		A or C (3)					
	B. Hand lever pump		A (3)					
	After draining							
Fueling the A-4	Motor pump and Disc indicator		B (5)		A (3)			
	After fueling		A or C (3)					

When fue ng watch the level ndicator at the instrument compartment first and ater when the container s 2/3 full the float level ndicator (3) Prior to this, you must remove its screw cap

Otherwise--you will be unable to see the indicator arm

You can also obtain the fuel leve from the measuring stick(4)
As soon as the conta ner s f ed you must shut down the B-Substance inlet

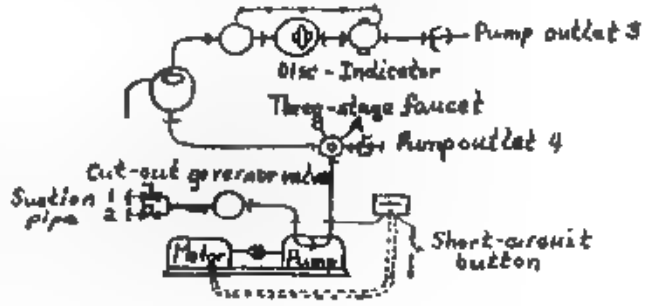
2 Fueling through the drain p.ug

You may do th s in two different ways
You may fill the container by
A) utilizing the motor pump aval able
B) or the semi-rotary pump

You will ut ze the sem -rotary hand pump only if there is no motor pump ava able or if there s only a small amount of B-Substance to be pumped into the container
You will find the instruments to be uti ized when fueling through the drainage plug, in the instrument compartment
The semi-rotary hand pump is stored there a so The motor pump apparatus is carried n a special pump trailer

A Fue .ng with the Motor pump

First you will prepare the motor pump apparatus for operation.
Unscrew the screw-caps of the suction-pipe connections (1) and (2)
and the pump outlet (4)
Connect the suction hose to the suction pipes (1) and (2)
Screw the pressure hose onto the pump outlet (4)
Open the cut-out governor valves on fi ler plugs (1) or (2) and on f er plug (4)
Turn the three stage faucet on posit on B, that is to the left



In the meantime you must perfor. the following duties in the instrument compartment

(1) Connect the filler hose to the drainage plug

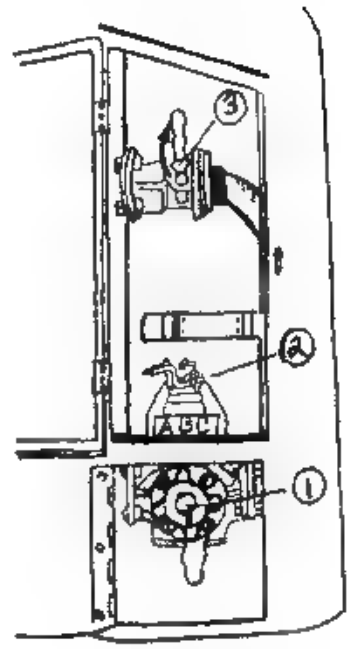
(2) Turn the four-way faucet on position B

(3) Close the cut-out governor valve

Prior to starting up the pump motors check if the pump is filled with B Substance

Once the required amount of B-Substance has been pumped depress the short-circuit button on the motor pump The motor will now stop Close the cut out governor valves on filler plug (1) or (2) and on filler plug (4)

After fueling you must turn the 4 way faucet n the instrument compartment on pos.tion A or C, that is to the left or to the right



B Fueling with semi-rotary hand pump

F rst you must screw the filler hose to the drain plug

Turn the four-way faucet on Position C that .s to the right

Open the cut out governor valve

Screw the pump handle to the semi-rotary hand pump

Otherwise--you are unab e to operate the pump

Once you have finished w th pumping, you must turn the four-way faucet on Position A, shut the cut-out governor valve and unscrew the pump handle

DRAINING OFF THE KW CONTAINERS

When dra ning the KW container you w l follow the same procedure you did ehen f.lling Pay special attention to the pos tion of the four way faucet and cut out governor valve Drain only through the drainage plug

A Removal by motor pump

Place four-way faucet on position B

C ose cut out governor valve

Start up motor pump During removal watch the ever ind cator in the instrument compartment and test the B-Substance with the ,easuring stick

After draining place the four way faucet on position A or C

B Removal by semi-rotary hand pump

P ace four way faucet on posit,on A, open cut-out governor valve
After drainmg close the cut-out governor valve

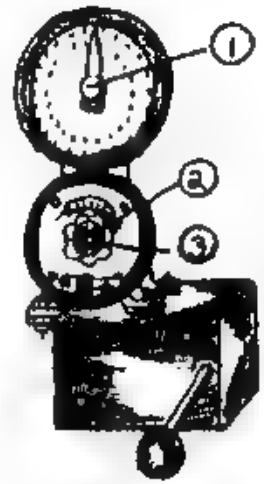
FUELING THE A 4

You wil ut lize the motor pump assembly Place it somewhat behind the r ght m ddle wheel of the long range rocket carrier
You need two B Substance tankers for fue ng, they are emptied at the same time
Connect one suction line each to the drainage plugs of the tank-truck The two other ends of the hose are to be connected to the two suct on plugs (1) and (2) located on the pump tra er e
Place the pressure line from the pressure plug (3) of the pump to the B Substance ascend ng line at the long range rocket carrier
Prepare the motor pump assembly for operation

Open the cut-out governor valves at Plug (1), (2) and (3)
Turn the three-way faucet on position A that is to the right

You w ll measure the amount of B-Substance pumped w th the disc in dicated Set the requested amount by adjusting the preadjustment device ofthe disc indicator Div de the amont through ten Then

(1) Make a rough adjustment by utilizing the large control button
(2) Make a fine adjustment by uti.zing the small control button
(3) By utiliz ng the return button move all po.nters of the recording mechanism on zero
(4) Pull out the control rod You hereby open the cut-off valve Lock the rod



In the meant me perform the following duties in the instrument compartment of the tank truck
Place the four way faucet on Position B
Shut the cut-out governor valve
Check if the pump is filled withB-Substance
Then start up the motor

Check if during operation of the pump small gas bubb es develop at the gas indicator n ght glass
As soon as 1000 l of B-Substance has been fi ed report it so that the B-Substance pilot valve is opened

Once the set amount of B Substance has f own through the pump t will turn off automat cally
Remember. Should the motor stop during pumping then the amount set at the ind cator is wrong

After fueling

With the semi-rotary hand pump empty the ascending pipe and the hoses and unscrew the hoses
Turn the four-way faucet in the instrument compartment on position A or C

DRAIN NG THE A-4

Connect the hose to the drainage plug of the B-Substance container and to the pipe connection with hand operated valve at the ascend ng p pe
Open hand-operated valve

B Substance will drain off automatically but may however be sped up by utilizing the pump

A SUBSTANCE

From the supply depot to the launch.ng site
the tank trailer is utilized to transport A-Substance At the supp y depot you will transfer the A Substance from the railroad tank car to the tank trailer

Prior to the transfer hould you detect dampness in the tank or any of its parts then you will dry the tra ler with warm gas (n.trogen or air)
Otherwise--the valve will freeze up

First remove all A-Substance or water from the A-Substance container
Shut the warm gas line at filler plug (4)
Open all valves--that .s gate valve (5) exhaust valve (2) and (3) angle valve (9) and degas fier valve (10)

Remember Valves mounted on lines with small diameter are to be opened wider than those with large diameter

Otherwise -the warm gas will not be able to flow through all lines and instruments

Unscrew the pipe connections at the manometer (11) and at the fluid level indicator (6) and turn them downward

Otherwise--Water pockets will develop in the U-links

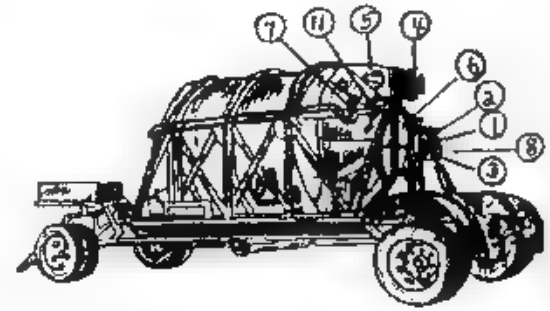
Now let the warm gas run through It lasts approximately six hours
With a soldering lamp carefully pre-heat the knee-shaped pipe sections on the two safety valves (7) of the inside container and exhaust gas tubing

Otherwise--water pockets wi l develop causing the safety valves not to function properly

Once you have finished drying remove the warm gas line from the filler plug, shut all valves and reconnect the tubular connections to the manometer and liquid indicator

FILLING THE A SUBSTANCE TANK TRAILER

Remember You will not connect all lines especially not the suction lines
Do not forget the copper gaskets
You w l utilize the A-Substance pump-assembly You will find it on the pump assemb y trailer or in the railroad tank car
Set up the pump assembly and secure it
(1) Open the cut-off valve to the fluid level indicator
(2) Open the cut-off valve to the degasifier tubing
(3) Open the degasifier valve to the direct-degasifier-line
(4) Connect the filler hose to the filler-cap and A-substance pump
(5) Open the gate-valve by turning the valve handle



POSITION OF THE VALVES FOR A SUBSTANCE-FUELING AND DRAINING

Valve open Valve closed
The number will give you the sequence.

Process		A-Substance-Transport Trailer						
		Filling line gate valve (5)	Exhaust Valve for: Direct exhaust gas line (3)	Exhaust Valve for: Exhaust gas cooling coil (4)	Shut-off valve for fluid level indicator (1)	Drain duct angle valve (9)	Vent valve (10)	Vent valve
Filling the trailer	Preparation	4	1	2	1			5
	Pumping							1
	After pumping	2	3					1
While driving and during prolonged parking of the trailer					1 (Open only if necessary)			
After the trailer has been drained completely				2	1			
After fueling the A-4	Preparation				1	3	4	2
	Pumping		3				2	1
	After fueling		3			1		2

Turn on the motor of the pump, but do not engage the pump as yet

Open both degasifier valves of the pump and dry its interior by heating it with the warm air apparatus
Open the cut-out valve of the suction line and the exhaust valve on the railroad tank car

These valves may be moved at only a very little opening of the degasifier valves and then only until they are properly sub cooled Only then will you completely open the degasifier valves, screw them back one fourth of a turn and let the A Substance gas blow off

Should A Substance emerge from the degasifier lines then turn the pump on and off several times Do this first at short, and as you go along longer intervals

After approximately 5 to 8 minutes "engaging time" the manometer at the pump will jump to approximately 3 atu (atmospheric overpressure)

Then

Leave the pump engaged and close both of its degasifying valves

So When filling the A-Substance into the container be sure not to go beyond the red marker on the fluid level indicator (6)

Once fueling is completed

Disengage the pump and turn off the motor
Furthermore shut the cut-out valve of the suction- line on the railroad tank car
Open carefully the degasifier valve on the pump and shut gate-valve (5) on the A Substance trailer

Let the A Substance evaborate in the hoses This takes approximately 5 to 7 minutes

Then loosen carefully the hose connections and remove the hoses
Shut exhaust valve (3) of the direct exhaust line but leave cut out valve (2) of the exhaust gas cooling coil open
In conclusion test the safety valve (7) by slightly lifting and lowering the valve ball

Parking and Driving the Loaded A-Substance trailer

Cut out valve (2) for exhaust gas cooling coil must be open
Exhaust valve (3) for direct exhaust gas removal must be closed

Watch the manometer It should show little or no pressure at all
The operating pressure amounts to 1 5 atu at the most
From time to time remove the ice accumulated at the degasifier plug ((9)

AFTER HAVING COMPLETELY EMPTIED THE A SUBSTANCE TANK TRAILER

Shut the cut-out valve to the exhaust gas cooling coil

Otherwise--dampness will enter the continer forcing you to redry it

FUELING THE A 4

Place the A Substance pump assembly into the hold ng device on the tra ;er and secure it
Connect the line between suction plug of the pump and angle valve (9) of the trailer
Connect the pressure line between the pressure plug of the pump and the A Substance ascending line on the rocket carrier
Open the cut-out valves (1) of the fluid level indicator
Start up the motor but do not engage the pump as yet Continue as you did above

Remember In order to pump you must open the angle valve (9) and the degasifier va ve (10) of the gas trap

Once the pump is finally engaged shut both degasifier valves of the pump and the degasifier va ve (10) of the gas trap Then open the exhaust valve (3) to the direct exhaust line

Now We Start W th Fueling the A 4

Watch the A-Substance degasifier-tube at the launching platform
When the A-Substance stops running it is an ndication that the container s filled
You must pay attention to many things
in this particular case to gaskets and valves

After Fueling

Disengage the pump and stop the motor.
Shut angle valve (9)
Carefully open the degasifier valves of the pump and shut the exhaust va e (3) of the direct exhaust line
Connect the hand valve to the A-Substance fueling joint
First loosen the hose connections
Remove carefu ly the hoses and immediately shut the connection plugs
Remove the A Substance pump assembly and place it into the pump trai er

Refueling

Connect the pump to the refueling device Report that you are ready for refueling. Fill the container to the overflow

Once you have finished refueling, disconnect the hose connection

DRAINING THE A-4

Small amounts are drained through the refueling coupling
Large amounts are drained faster through the fueling plug

T-SUBSTANCE

Railroad tank cars bring the T Substance to the supply depot, sometimes the tank trucks are loaded on the railroad cars

From the supply depot to the launching site

in any case, however, utilize the tank truck In the instrument compartment of the tank truck you will find the pumps and the fueling, draining and refueling device
Open the doors at the end of the tank truck You will then see the starting motor on the left, the motor pump in the middle above it the semirotary hand pump, behind it the overpressure valve and the two reflex glass indicators, and finally the pipe lines with faucets and covers

FILLING THE TANK TRUCK

You may fill the tank truck by utilizing the filler plug or the over-pressure valve When filling through the filler plug you may use the semirotary hand pump or the motor pump When filling through the overpressure valve you may use the motor pump
When doing this you have to set the three way faucet (1) and the faucet (2) through (4) separately, operate the change-over valve of the semirotary hand pump and connect the hose different fittings. Just what you have to do is shown on Page 118

Before using the pumps
fill the water container of the tank truck

Otherwise--you will not be able to wash off the areas contaminated by the T-Substance

POSITION OF THE COCK AND VALVE WHEN FUELING T-SUBSTANCE

Process			Cock 1	Cock 2	Cock 3	Cock 4	Remarks	Changeover valve 5 hand lever pump
Filling	Above the filling sleeve	With hand-lever pump					Hose connection at "A" and "B"	V
		With meter pump						D
	Above the safety valve						Hose connection only for "A"	D
After Filling							[redacted]	
Fueling		with hand-lever pump					Hose connection [redacted] At "B" only	V
		with meter-pump						D
After Fueling								
At fuel transfer		with hand-lever pump					Hose connection [redacted] at "A" and "B"	V
		with meter-pump						D
After the fuel transfer								
Draining							Hose connection at Cock "3"	

This water is also utilized for rinsing the hoses as well as for washing off contaminated areas on the truck and on the tires

Screw the glass flow indicators into the hose lines

Otherwise--you will not be able to watch the flow of the T-Substance

Connect both ends of the suction and pressure hoses first, then operate the faucets and valves according to the instructin chart

Otherwise you might be endangered by the T Substance remainder in the pump

Connect all hoses and lines well

Otherwise the flow of the T-Substance will be very poor and its leakage create additional hazards.

Open the lid to the container

Otherwise--the pump will not operate correctly at filling and draining The air filter must be open

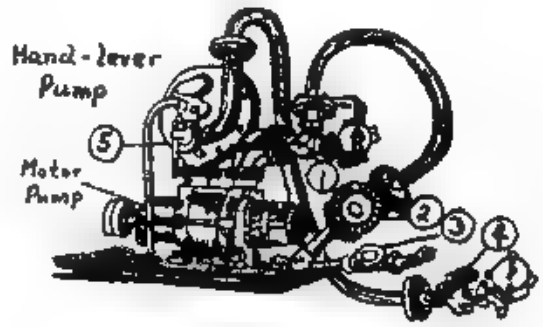
At the Motor Pump

Fill up the two side containers of the frame with water
The water will thin out the T-Substance coming through the sealing ring

Otherwise--The T-Substance would be dangerous

From time to time empty those vats and refill them with fresh water. Fill the rotary pump with T-Substance

Otherwise there will be no suction



After Filling

Turn the three way faucet (1) to the left
Close faucet (4)

Otherwise--Due to the pressure of the gases T-Substance will spray from the pump-housing

FUEL TRANSFER

Should you be required to transfer T-Substance into your tank truck then utilize the chart on page 118 for adjusting the faucets and valves

Draining the Tank Truck

Park your vehicle so that it will slope to the back Follow instructions on the chart You will not utilize any pumps for draining

FUELING THE A-4

In order to fuel the A-4, fill the T-Substance measuring tank located near the erecting-frame of the rocket carrier first
For filling it you may utilize the rotary hand pump or the motor pump
The position of the faucet and valves is shown on page 118 under the heading "Fueling"

Be careful. The T Substance measuring tank is filled by the motor pump in less than one minute
Fill the measuring tank to the overflow
Your comrad from the propulsion-unit crew will notify you as soon as the container is filled
He will then empty it into the A-4 and let the contents of the overflow container run into the tank truck
After fueling pump the hoses dry and flush them with water

DRAINING THE A 4

is done by utilizing the drain cock
After draining flush the container thoroughly

Remember The fire truck carries water to put out T-Substance fires
Put out T-Substance fires only with water, never use the tetra-fire extinguisher
Use only water for fighting T-Substance fires

Z-SUBSTANCE

Z-Substance is transported in cans
Be careful Never transport T- and Z-Substance on the same truck
Never fill them in the same container not even if you have rinsed the container well
Transport T- and Z-Substance separately
Otherwise you will end up in a hospital

REFUELING THE A 4

Your comrad from the propulsion-unit crew will fuel the A-4 with Z-Substance

DRAINING THE A-4
Open the drain cock
Remove the contents
Afterwards flush the container and pipe lines thoroughly with water.

Should living be worth anything to you
MORAL: Then never smoke when fueling

IN THE REMOTE CONTROL POSITION

A firing site contains two remote control sites The Combustion-Cut-off and Guide Beam position. Both are installed behind the firing site

The radio insta..ation is located at the combustion cut-off site where upon s certain velocity the power plant of the A 4 is cut off.

Whether or not the A-4 will reach the required firing range and destination depends upon how well you have done your job

The guide beam position is set up only for launching requir ng utmost target accuracy. With your guide beam devices you are able to loosen the deflection of the A 4 considerably.

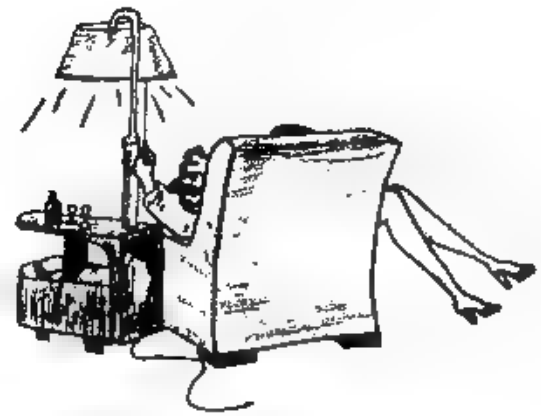
MOTTO:

It often depends upon the right moment
at which you shou d cut off the light.

COMBUSTION CUT-OFF GROUND INSTALLAT ON

The power plant in the A-4 must be cut off at the right moment It is called combustion cut-off

Should combustion cut off be given at a high velocity of the A-4, it will reach a long distance If combustion cut-off is given at a low velocity of the A-4, it will reach only a short distance It therefore is important to give combust.on cut-off at a very certain velocity of the A-4



Only then will the correct firing range be attained
The following belongs to the combustio cut-off ground installation.

1. The Transmitter Truck

   mainly contains all the different transmitters

2 The Cut-off Evaluation Truck

   contains the V_0 test-receiver and frequency measurement device

3 The Dipol-trailer

   carries the dipol antenna with accessor es and the high voltage cable for the cutoff signal transmitter

4. The Generator Trailer

   produces the current for operating your instal.ation

You may divide your job at the combustion cut-off installation into the following catagories:

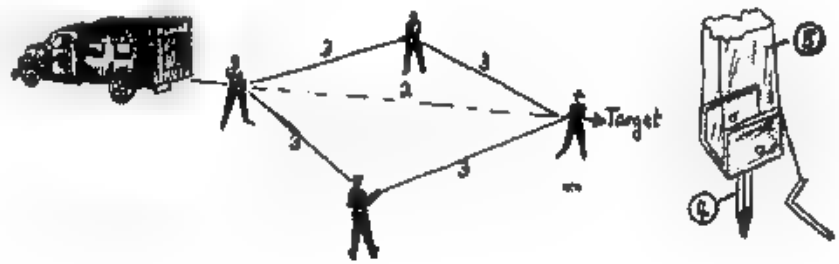
1 Preliminary duties- this includes mainly the erection of the antennas and cabling
2 Duties in the transmitter truck
3 Duties in the cut-off evaluation truck

PRELIMINARY DUTIES

After receiving the order from the officer in charge park the vehicle in the areas designated by the surveying crew

Erect on of the Rhombus-Antenna for the V_o-test-transmitter

You will find the antenna in the transmitter truck. For erection utilize a measuring tape It is divided into four equally long pieces and one longer piece by knots.



(1) Fasten the measuring tape to the transmitter truck. Hereby you will receive the correct distance between antenna and truck

(2) Place the ong piece in the direct on of fire

(3) Stretch the four short pieces rhombically. The four knots will designate the corners

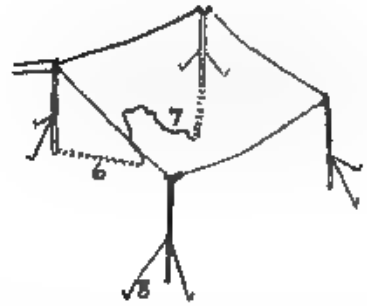
(4) Drive the mast supports in at the corners

(5) Place the antenna rods into the mast supports The antenna rods are assemb ed from two parts.

(6) Bend the antenna rods toward the inside.

(7) Lay out the antenna w re and connect it

(8) Place the guy ropes on the hook of the antenna rod. Straighten the antenna rods and anchor the guy-ropes.

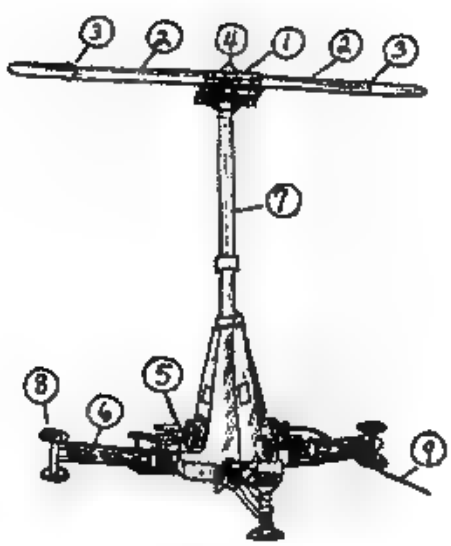


mportant Always connect the antenna wires to the vehicle immed ately

ERECTION OF THE RHOMBUS-ANTENNA FOR THE V_o TEST RECEIVER

You will locate the antenna in the cut-off eva uation truck where it will be set up in the same manner you set up the antenna for the Vo-test transmitter.

Remember nowever' the measurement are half as large Each rod is anchored by only one guy rope



Erection of the dipoles for the cut-off signal-transmitter

Park the Dipol trailer in line with the Rhombus-Antenna. The Distance from the cut off evaluation truck is approximately 25 m

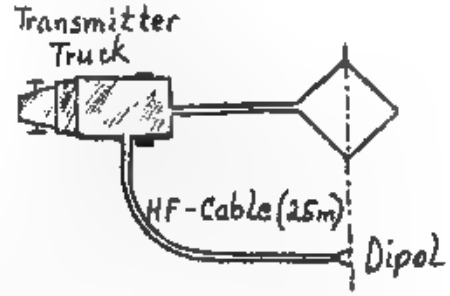
(1) Place the Dipol head on the folded mast

(2) Insert the Dipol arms.

(3) Adjust the arms lengths according to the calibration chart

(4) Adjust the condenser C_1 according to the calibration chart

(5) Adjust condenser C_2 according to the calibration chart



(6) Unfold the footings

(7) Erect the Dipol upright in the direction of fire

(8) Disconnect the chassis. Solder the Dipol diagonaly to the ground spindles

(9) Reel off the antenna cable and lay it out. Lay out no curves with less than 1 meter in diameter
Camoflage the chassis.

Making the Connections

Lay out 3 Field-Trunk Cables and 1 High Voltage Cable from the cut-off evaluation truck to the transmitter truck. Lay out a cable from the current supply trailer to the cutoff evaluation truck or transmitter truck. Connect the cables on the outside of the truck, the high voltage cable is connected on the inside of the truck

Remember. Cable couplings are designated by color and are not to be mixed up

Drive one ground conduction pipe each into the ground at the cutoff evaluation truck the transmitter truck and the current supply trailer and connect it to the ground terminal of the truck

Your work will progress well

MORAL: Should all preparations have been made properly

THE TRANSMITTER TRUCK

Besides other devices:

The transmitter truck contains the V_0-Test-Transm tter transmit a certain number of electrical waves per second from which the speed of the A-4 is ca culated
Per normal frequency auxiliary transmitter transm ts exactly twice as many waves as the V_0-Test-Transmitter. These waves are utilized for the V_0-Test-Transmitter.

It further contains.

The cut-off s gnal transmitter, it gives the signa for combust on cut-off
The phantom signa modulator, it gives a disguise for the combust on cut-off signal
The cut-off s gnal modulator; it gives the correct combustion cut-off signal
The cut-off s gnal control receiver; t is similar to a cash reg ster It checks to see if the signal given is correct and registers same.

The ind vidual devices must be:

adjusted,
engaged,
turned according to the ordered frequency

Prior to each launching you will receive an order nform ng you of the <u>frequency to be used</u> It might, for excamp e be green 3 ABC-425, D-1, E-2--O, 56Sec ; red 6; 301B Abel Long Transmission

<u>Remember</u> "green" always refers to the VO-Apparatus
"red" always refers to the control unit

How to adjust the individual devices will be mentioned in detail

<u>Starting Up the Transmitter Truck.</u>

Give the order to start up the generator set
Depress the switch buttons (1) and (4), through (5) engage voltmeter (6) and test through switches R, S and T. The deflection of the pointer must be 220V.
Through (7) engage the control panel and through (8) the battery voltage

Place lever switch (9) in a downward position and test take-off contact and contact timer

As a result lamp (10) contact timer will go out
After 50 seconds you will hear the antenna contactor operate. After an additional 10 seconds it will fade out

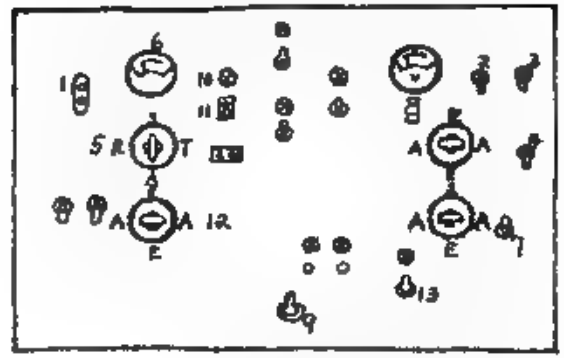
Place toggle switch (11) in a downward position thus the contact timer will go into the zero position

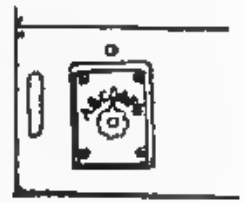
When lamp (10) produces a dark flicker, the return movement has ended

Now place toggle switch (11) back into the neutral position

Light (10) burns with normal brightness.

Turn switch (12) on "on"





A THE CUT-OFF SIGNAL TRANSMITTER

In addition to the power supply unit the cut-off signal transmitter contains four fields.

Field I	Control Panel
Field II	Control and Amplifier Stage
Filed III	Amplifier and Modulator Stage
Filed IV	Final Power Stage

Adjusting according to the ordered frequency

The ordered frequency contained the following specifications: red 6, 56 Sec , Long Transmission

Adjusting the Carrier Frequency red 6

Open Shutter 1 in Field II.

You will find the rotary switch D 1 behind the shutter adjust it according to the frequency For example, for red No.6 you will turn it on D

Close shutter 1 again

Setting the Long Transmission and Time

In the Relay Box. Place the short circuit plug on "long".
Turn the Selector Switch (1) on 56 Seconds.

Engag ng the Transmitter

In Field III turn the Tumbler Switch to the top.

Then--you wi l have better synchron zation.

n Field IV turn Button D 5 on "f.xed"

Then--the tube outputobta ned will be used up by the antennna short circuit (electrical bulb)

Otherwise--the anode tins will glow white and the tube w l be destroyed

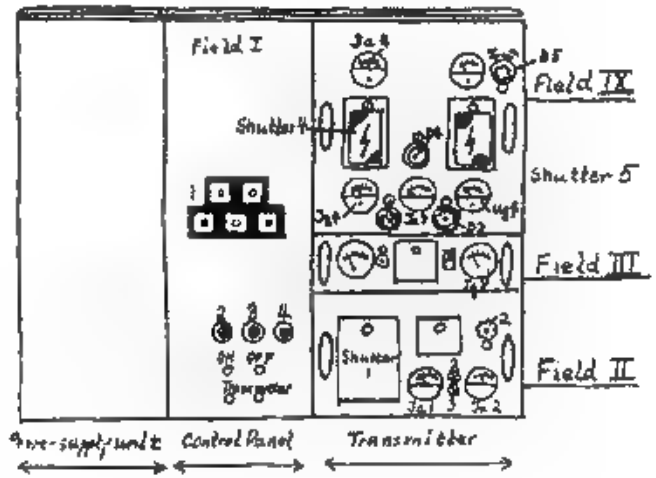
ın Field I Depress all automat c cut-outs (1).

n Field II Bulb (2) and (3) must light up.
Lamp (2) or (3) will go off as soon as the correct temperature for the thermostat has been reached

In Field Depress Button (5) from 2 to 3 Seconds
Then a motor w th switch mechan sm will start up
The red signal lamp (2) must light up

Otherwise--the filamentvoltage grid and screen grid voltage is not turned on

Remember. Should lamp (2) not light up immediate.y then depress Button (5) up to 3 times



In Field II the deflection of pointer Ja 1 must amount to approximately 15 mA

Important After every trip made by the transmitter truck let the transmitter operate for 15 minutes Before you make any further connections

n Field I Depress Button (5) from 2 to 3 seconds.

After approximately 3 minutes signal lamp (3) must light up This will tell you that 800 volts are turned on

In Field :V the deflection of the pointer Ug 4 must amount to approximately 80 to 100 scale sectors

In Field I Depress Button (5) from 2 to 3 seconds

approximately one minute the red signal lamp (4) must light up

It will tell you that 1500 volts are turned on.

Synchron zing the Transmitter

In Field II Turn lever switch (4) to the right on "Synchronization"

By utiliz ng Button D-2 regulate the def ection of the pointer Ja 2 on minimum value and Jg 3 in Field III on maximum value.

n F eld IV Set the deflection of the pointer Ja 3 on minimum value by utilzing Button D 3.

In doing this the deflection of the pointer Jg 4 must show a maximum value

Turn Button D 4 until Ja 4 shows the smallest deflection. At the same time Jant must show the highest deflection Turn Button D 5 to the left on loose and again synchronize with D 4

Synchronize the measuring device Jant on maximum value by s owly turning the Button D 5 to the right The electrical bubs of the mute antenna will then light up the brightest

You will now again synchronize the transmitter by utilzing Buttons D 1 to D 5

In Field III After comp eting synchronization turn lever switch in a downward position (center Line) so that the deflection of the pointer of the measuring device Jant in Field V will approximately drop n ha.f

In Field II turn lever switch (4) to the left on "Operate"

After making these adjustments report that the cut-off s gnal transmitter is ready for operation.

.mportant In Field IV the anode tins of the power tubes behind shutter (4) and (5) may produce a dark glow only

Disconnecting the Transmitter

In Field 1 you have the push-buttons (6) and (8) for disconnecting the transmitter By utilizing push button (8) you wi only disconnect the 1500 v stage You will utilize it should the transmitter not be used for the time being, but must be ready for operation again in a very short time. By utilizing push button (6) all voltage is off should you desire to turn off the transm tter completely

B V_o-CALIBRATING TRANSMITTER WITH NORMAL FREQUENCY AUXILARY TRANSM TTER

In order to operate the V_o-Calibrating Transmitter you must make connections at the first cabinet as well as at the output cabinet

Adjustment According to Ordered Frequency

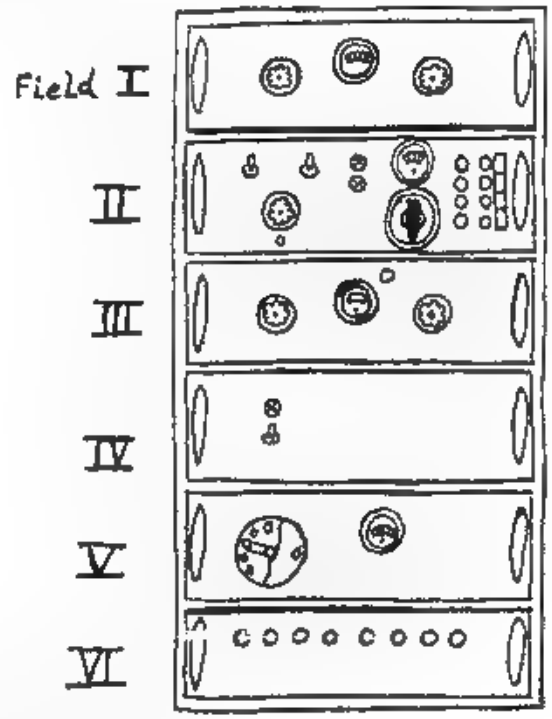
The ordered frequency requested: green 3.

Adjusting the Frequency green 3

First cabinet

In Field V — Remove the cover of the "frequency adjustment device 1" Turn the adjustment on position 3

In Field I and III — Set the buttons of the "frequency adjustment device 2 to 5" on the ordered frequency value 3.
Remember: In Field II all switches must be turned off



Output Cabinet.

Close or open the two latchets (1) for the coupling spools (2) on the output cabinet as shown on the table located above frequency "green 3"

Engaging the Transmitters

Instruction Table for the Transmitter Truck.

Engage Switch (13)

Output Cabinet Place both slide latchets (3) toward the front on "mock antenna" --In Field I depress the five automatic cutouts (1).

Dpress pushbutton (9) this must draw the antenna contactor in the output cabinet audibly.

The ventilator contactor of the output cabinet may be watched through the back right truck door

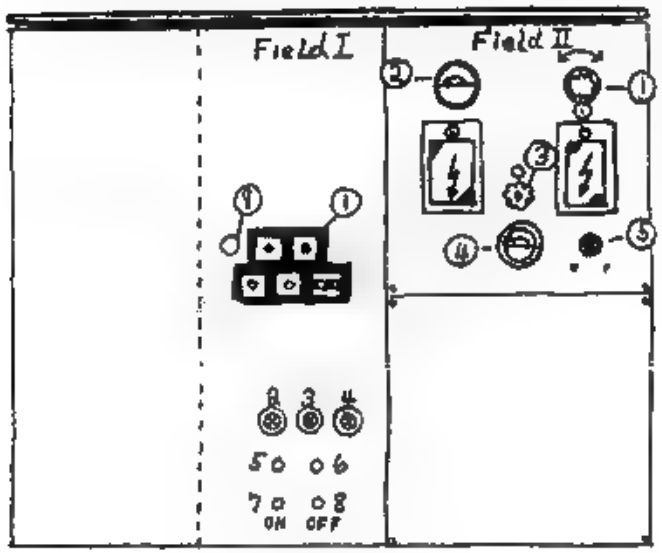
Remember. The voltage of the transmitters can be engaged only in Field I of the output cabinet

In Field II turn knob (1) on "srable"

In Field I depress Button (5) from 2 to 3 seconds A motor with switch mechanism will then start to operate, after approximately 3 seconds a green signal lamp (2) will light up

Otherwise--filament voltage and grid voltage are not turned on

Remember. Should lamp (2) not light up then the switch arrangement was not in the correct position normally. Repeat the engaging of Button (5) up to 3 times



First Cabinet

In Field II the control lamps (3) must light up

Important. After each trip made by the transmitter truck or after exchanging one of the rectifier tubes you must let the transmitter operate for 15 minutes Then do not make any further connections

Output Cabinet

In Field I depress Button (5) again from 2 to 3 seconds The switching motor will start up again After 2 minutes the signal lamp (3) must light up green. It will tell you that an 800 volt current has been turned on.

In Field II the measuring device (4) will show a deflection

In Fie d I Again depress Push Button (5) 2 to 3 seconds
The switching motor will start up again After approximately 3 Seconds signal lamp (4) will light up This tells you that 1500 volts are turned on.

Remember: First Cabinet' In Field II the four control lamps (4) and the two control lamps (5) must light up In Field V the deflection of the pointer (1) must be located in the green zone.

Synchronization of the V_o-Calibrating-Transmitters

First Cabinet

In F.e d II turn the measurement selector switch (6) on Position 2---III and depress
Watch measuring device (9)

In Field III turn the frequency adjustment Knob (2) until the measurement device (9) in Field II shows the largest deflection. By uti izing the turn knob of the "frequency adjustment device 3" the Measuring Device (2) is synchron zed with the highest value shown
Remember The Knob "frequency adjustment 2" and "frequency adjustment 3" buttons are mot required to be accurately set on the previously adjusted number any more.

Output Cabinet.

In F e,d II adjust the turn Knob (3) in such a way that the brightness of the electric bulbs (mock antenna) are at maximum.
The deflection of the pointer of the measuring device (2) returns to the lowest value
Retune it by utilizing push button (1)
Remember. The output cabinet must be turned simu taneously with the first cabinet.

Engaging and Returning the Normal Frequency Auxiliary Transmitter

The V_o-Calibrating-Transmitter must be engaged and turned prior to starting up the transmitter

Connections are made only in the first cabinet

In Fie,d II Place the lever-switch (8) into the upward position Turn the measurement selector switch (6) on position 2---1 and depress Watch measurement device (9)

In Field I Turn the Frequency Tuner Knob 4" until the measurement device (9) shown its largest deflection. Tune the measuring device (10) with the highest indicator value by util zing "Frequency tuner 4" By look ng through thecontrol window check if the e ectric lamp has maximum brightness.
Remember Ad,ustment of the turn knob "Frequency tuner 4" and "Frequency tuner 5" is not required to coincide with the number set .....

At the Service Panel of the Transmitter Truck

Turn Switch (13) on "off"
By doing this the e ectric bu bs of the mock antenna will go off
Now make the report that the V_o-Calibrating Transm tter and the Normal Frequency Auxiliary Transm tter are ready for operation

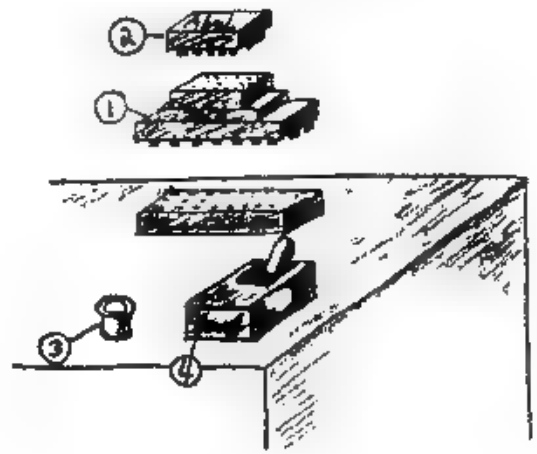
D sconnecting the V_o-Ca .brating Transmitter

D fferentiate

1 Case Temporary disconnection (up to a few hours)
2 Case Fina disconnection

1 Case Should you depress Oush Button (8) n Field I of the output cabinet then the anode current of 1500 vo ts is reduced to 1300 vo ts
Should you depress Push Button (7) in F eld I then the anode current w il rise to 1500 vo ts aga n

2 Case Should you depress Push Button (6) in Fie d I of the output cabinet then a current is removed from the transmitter A l contro amps will go out



C THE CUT-OFF SIGNAL MODULATOR

Setting the ordered frequency

for example, 301 B, Anton; red 6

(1) Place the Frequency Selector-Plug 301 B on the counterpart

(2) Place the sequency selector plug "Anton" on the Frequency Se ector-Plug

(3) Depress the automatic cut-out

(4) Engage the Switch at the cut-off signa modu ator.

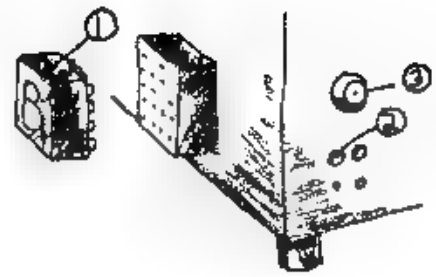
D. THE PHANTOM SIGNAL MODULATOR

Setting the ordered Frequency, for example, 301 B

(1) Plug in the Phantom-Signal Modulator key B

(2) Engage both automatic cutouts

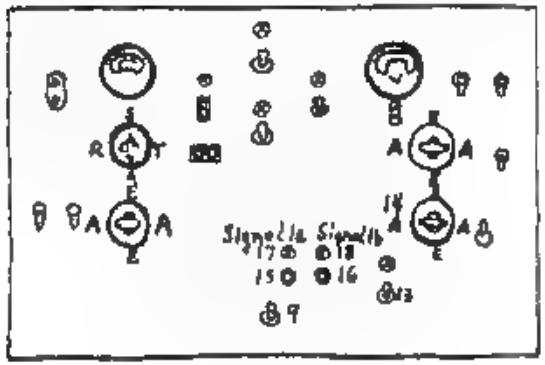
(3) Watch if the white control lamp at the Phantom Signal Modulator lights up.



E. CUT-OFF TEST RECEIVER WITH TRANSFORMER

Setting the ordered Frequency, for example red 6, Anton
Plug in the high frequency insertion Number 6
Plug in Sequence Selector plug "Anton"

In order to test the cut-off signal modulation the cut-off signal transmitter must be engaged and turned.



At the Service Panel of the Transmitter Truck turn Switch (13) on "in"
By doing this the Transformer will start up
Simultaneously depress the Button (14) and (15)
Watch if indicator (16) signal 1a and after
3 Seconds Indicator (17) Signal 1b will appear.

Testing with Cut-off Evaluation Truck

After receiving the order from the cut-off evaluation:
"Test with V_0-Calibrating-Transmitter and engage Modulation". At the service Panel of the Transmitter Truck: Move Switch (13) on "in"
(The VO-Calibrating-Transmitter must be engaged.

First Cabinet:

In Field V on the Switch lever "Modulation"
The lamp located above it must light up

After completing the test
P ace Switch (13) and Switch Lever "Modulation" again on "off".
After receiving the order "Turn on, all devices for signa. testing" from the cut-off evaluation truck, you will follow the proceedings of the previous test.
In addition engage:

the Cut-off Signal Transmitter
the Cut-off Signal Modulator,
the Phantom Signal Modulator and
the Transformer.

Call up the Cut-off Evaluation Truck and report "Transmitter Truck prepared for signal testing "
After receiving the order from the Tansmitter Truck "Test the take off"
At the Service Panel of the Transmitter Truck place
Switch (9) "take-off test" on "In" The contact timer will now start up.

The indicators (17) and (18) are actuated from the cut-off evaluation truck
Report the appearance of indicator signal 1a (17) and signal 1b (18) individually to the cut-off evaluation truck
Turn Switch (13) at the Service panel of the Transmitter Truck and Lever Switch "Modulation" at the first cabinet on "off" again.

Preparing the Vo-Calibrating Transmitter for Launching

My friend, you must now be careful
Prior to toughing the lash you must
Disconnect the Automatic Cut-out
Otherwise you will be carried out as a corpse.

Thus:
1 Move In Field I turn off automatic cut-out W at the output cabinet
2 Move At the output cabinet push both lashes (3) back on "Rhombus Antenna"
3. Move. At the output cabinet engage automatic cut-out W in Field I.
After receiving the order, from the Cut-off Evaluation Truck: "Transmit the Vo-Calibrating-Transmitter for 1 Second" At the output cabinet In Field I depress Button (9) for 1 Second

Be Careful! Your Antennas Glitter"

Depress the Button for only 1 Second,
MORAL: so that the enemy cannot detect you.

Here it counts to determine
MOTTO Ve ocity through electric waves
So that one may be able to determine
The correct time for combustion cut off

The speed of the runner is determined by utilizing a Stopwatch
The velocity of the A-4 is determined by utilizing the cut-off Evaluation Truck
The Cut Off Evaluation Truck contains primar ly
the V_0-Calibrating Transmitter, it receives electric waves which are transmitted by the Frequency Doubler of the A-4 Per Second there are less waves transmitted than from that of the normal Frequency Auxiliary Transmitter. The difference is a measurement for determining the Velocity of the A-4

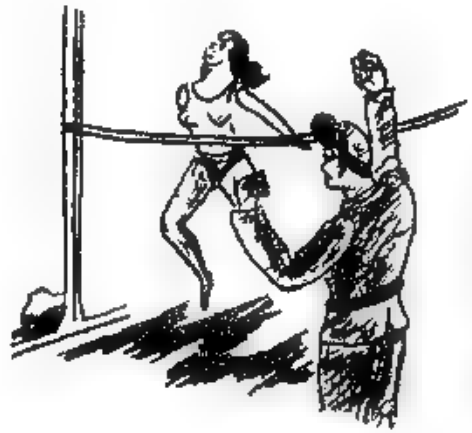
The Frequency Device At cut-off veloc ty of the A-4 it s.gnals the Cut-off Signal Modulator making the latter form the combustion cut-off signa and relay it to the cut-off signal transmitter

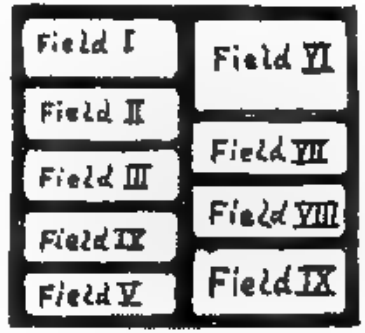
A l instruments of the Cut-off Eva uation Truck are stored in the V_0-Ca ibrating Transm tter It contains 9 Fields and ooks like this

Field I Control Panel and Inspection Panel
Field II Bridge Amplifier
Field III Resonance Amplifier
Field IV V_0-Calibrating Transm tter
Field V Empty
Field VI Frequency-Resistance Bridge
Field VII Empty
Field VIII Audio-Frequency Oscillator
Field IX Main Connected Unit

You are to engage the V_0-Measur ng-Device and test its tubes adjust it according to the ordered frequency, test and ready for launching

THE CUT-OFF EVALUATION TRUCK



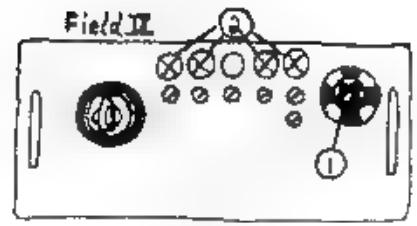


Putting Into Operation

In Field II Turn on Switch (1)
Check, if after one Minute the Control-lamp (2)
--not the one in the middle--lights up

Remember: The Current consisting of 220 V/50 Hz may fluctuate between 210 and 230 V only.

Otherwise--the entire measuring device will not operate correctly



Should one control lamp go out then disconnect immediatley and rectify the fault

Testing the Tubes

utilize in Field IV the Measureing Device (1)
in Field II depress Selector Switch (2) in position 1, 2 3 4 and 6. The deflection of the pointer of the Measuring Device (1) in Field IV must be located in the red zone

Remember Position 5 of the Selector Switch is designated by a ring A tubular test in this position is possible only then when testing without the transmitter truck has been completed
You will find tubes 1 to 4 in Field II
Tubes 5 and 6 in Field I

in Field III Depress Selector Switch in Position 1 2 and 5, 6 7 The deflection of the pointer of the Measuring Device (1) in Field IV must be in the red zone

in Field I Place the Switch marked "Testing" on the middle position

in Field III Depress the Selector Switch in Position 3 and 4 (designated by a ring) The deflection of the pointer of the measuring device (1) in Field 4 must be located in the green zone (0 05 o,2 mA)

in Field I Turn the Switch marked "Testing" to the right

in Field VII Depress the Selector Switch in position 1 and 2 The deflection of the pointer of the measuring device (1) in Field IV must be within the red zone

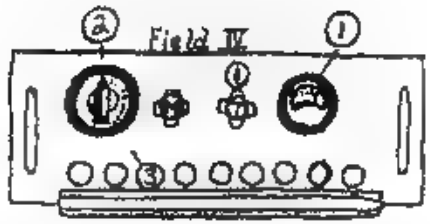
In Field IV Turn Button T to the right unt i the Number 1 appears at the circular opening above the control Button T.
Depress Selector Sw tch (2) n Position 1 to 5

The deflection of the pointer of the measuring device (1) must be within the red zone

Turn Control Button T to the left until Number 100 appears at the circular opening

Depress Selector Switch (2) in Position 7 and 8, the deflection of the pointer (1) must be within the red zone

Remember. Should you not get into the required zones then exchange the tube in question

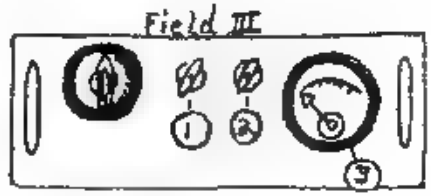


Setting According to the Ordered Frequency

The following Frequency Specifications were ordered
E = 3 - 0, A B C = 425; D = 1; green 3

Sett ng the Resonance "3 - 0"

In Field I I Turn Switch (1) on Position "3"
Switch (2) on Position "0"



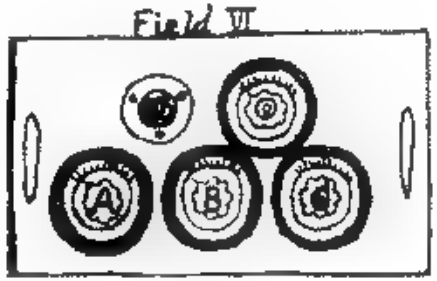
Setting the Oscilator Stage "green 3"

In Fie d IV Open the shutter and place the Crystal "Po 3" into the two white-edged sockets designated 'crysta ". Then close the Shutter again

Setting the Launching Frequency "425"

In Field VI Turn the Selector Switch A on "400"
Se ector Switch B on "20"
Se ector Switch C on "5"
Control Button D on "1"

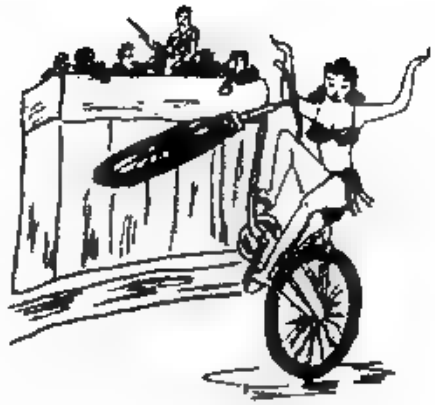
Remember: The Selectr Switches must be correctly engaged



THE THREE TESTS OF THE V_o-MEASURING-DEVICE

Prior to putting on a show the Bicycle Acrobat will perform three tests They are

first, she will check the bicycle
second the balancing act
third, her movements coincide with the music



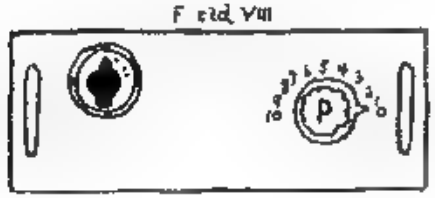
You will also conduct three tests in regard to the V_o-Measuring Device

first you will test the instrument of the measurement device by itself, that is, without the Transmitter,
secondly, you will test the measurement device together with the V_o-Calibrating Transmitter in the Transmitter Truck
third, you will test the collaboration of all devices of the BS ground installation including the cut-off Signal Transmitter

Now pay attention

1. Case: Testing without Transmitter Truck
Even thorough you are only testing the instruments of the Indicator Device without the Transmitter, you must notify the crew of the Transmitter Truck since the connecting cables are already payed out

Otherwise--testing in the Transmitter Truck may cause interference



A Testing the Frequency Measuring Device

In Field VIII Place Regulator Button P on Position 0

in Field IV Turn the Button marked T to the left until the number "100" appears in the circular opening

In Field I Place the lever-Switch "Testing" to the right By doing this the control lamps (1) and "Transmitter" must light up

In Field VII <u>Turn Button P slowly to the left</u>

The following Pointer Deflections and Control Lamps must appear now

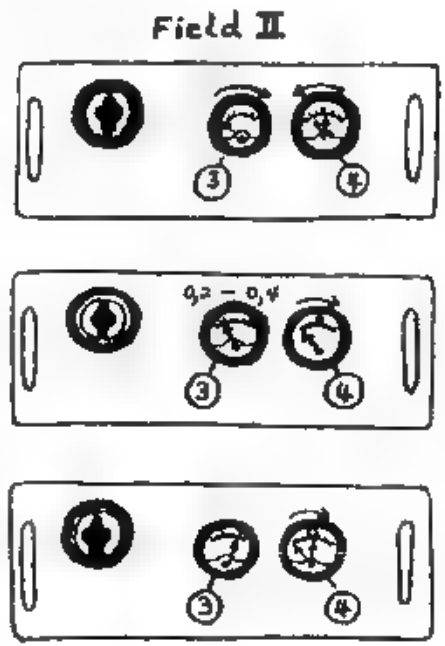
a) In Field II the Deflection of Pointer (3) will slowly increase and the deflection of pointer (4) will move from the zero position to the left

b) In Field II the Measuring Device (3) has reached the green zone 0,2 to 0 6 mA
In Field I the Lamp "Reception" will light up

c) In Field II the pointer of (4) will slowly return to zero,
in the meantime the pointer of (3) is within the red Zone
In Field I at the Zero Position of the Measuring Device (4) the lamp "Warning Signal" will light up

d) In Field II after returning to the Zero Position the pointer of (4) will immediately return to the left again, due to the fact that the resistance bridge is now set automatically by a relay on the main cut-off signal Frequency

<u>Remember</u> Control Button P must always be slowly turned to the left in Field 8 causing the thusly formed Tone in Field I to be heard in Loudspeaker (2) The Measurement Device (3) in Field III indicates nothing as yet



c) In Field I the pointer of (4) goes through the Zero Position for the second time
In Field the Lamp "Home Signal" will light up at the same time the Lamp "Warning Signal" will go out

d) In Field II the Pointer of (2) will go back At a deflection of 0 2 and 0,1 mA the following will die out
In Field I Control Lamp "Reception". Lamp "Home Signal" remains lit

<u>Remember</u> In order to repeat the test, Control Button P in Field VIII must be returned to the zero position.
The Lever Switch "Testing" in Field I must be put on the middle Position for a short time and then returned to the Position on the right

B. Testing of the Signal Release by Manually-Given Cut off Signal

This test takes place in Field I only
Depress Button "Take off" then the signal Lamp "Take-off must go out
Place Lever Switch "Testing" to right
Lamp "Transmitting" will light up.

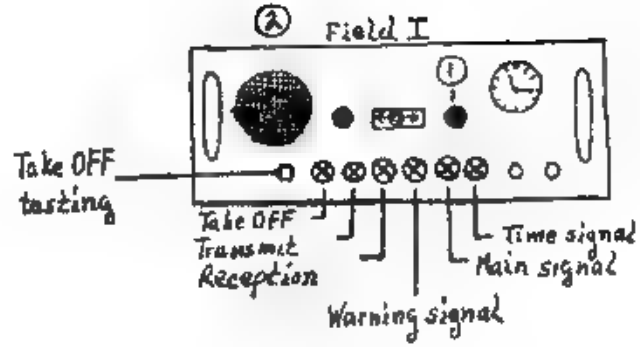
Depress Button "HS Hand BS" several times
No Signa Lamp should now light up

Depress Button "VS Hand BS".
Lamp "Warning Signal" must now light up

Depress this button again;
Nothing should change

Depress Button "HS Hand BS".
Lamp "Warning Signa " must go out and at the same time
Lamp "Home Signal" and "Time Signal" must light up

Depress this Button again
Noth ng may change



2 Case Testing with the V_o Calibrating Transmitter

In order to conduct this test a high voltage cable was played out from the cut-off Evaluat on Truck to the Transmitter Truck
By way of this cable you will test if the stages of the V_o-Test Receiver operate correctly via the Rhombus antenna After this you w l. check the entire frequency apparatus
Call the Transmitter Truck and give the fo, owing order
"V_o-Cal.brating and normal frequency Auxiliary Transmitter and Modulation engage at the First Cabinet"

A Testing the V_o-Test-Receiver at the V_o-Test Device

In F e d I Place Lever Sw tch "Read.ng" to left
In Fie.d IV Turn Button T completely to r.ght on Position 1
Turn Test-Transformer (2) on Posi.tion O and depress Switch lever
Def ect on of Pointer)1) must be within green zone.
Remember Be careful to distinguish the Test Transformer (2) with Position T and M from Buttons T and M

Turn Test Transformer (2) on Posit on M and depress Switch Lever
Turn Button M until Test Device (1) shows a maximum deflection The deflection must be within the green Zone
Secure Button M by utilizing the screw
Place Test Transformer (2) on Position T and depress By turning Button T to left the deflection of the Pointer (1) must be carried into the yel ow Zone

Otherwise -the receiver is not modulated correctly

In F eld V.II Place the Button P into Zero position and then turn it to left.
In Field I a surging sound must be heard in the loudspeaker (2)
In Field III the Deflection of the Pointer (3) must increase
In Field V Place the Test Transformer (2) in posit on A and depress; deflection of the Pointer (1) must show approximately 1 to 3 mV.

Otherwise--the output voltage will not be correct

In Fie d VIII Turn Button P to left unt l Test Device (3) in Fie d II show highest read ng
In Field IV P ace Test-Transformer (2) in Position R Watch the Deflect on of the Test Device
In F eld V I Turn Button P from its orig nal pos tion to the eft and then to the right
In Field IV The def ection of Pointer (1) must drop both times

Otherwise--the Automatic Control of the receiver is not correct

B Testing the Frequency-Testing Apparatus

During this test you are to follow the same proceedings you did n paragraph 1
In F eld V.II you are to slowly turn Button P from Posit on O to Position 10

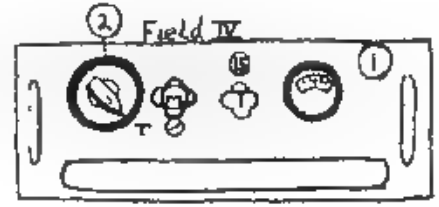
3 Case Testing with V_o-Calibrating Transmitter and Cut-off Signal Transm tter

Tests are now conducted in order to determine if all instruments of the entire cut-off ground installation co aborate
Call up the Transmitter Truck and order "Engage al devices for signal testing"
After receiving an answer from the Transm tter Truck, g ve the order "Engage the Lever Switch Take-off Testing at the Switchboard of the Transmitter Truck".

In Field I	Lamp "Take-off" will go out, after approximately 56 Seconds Lamp "Transmit" will light up
In Field VIII	Turn Button P very slowly to the left
n Field I	Lamps "Reception" and "Warning Signa," and "Home Signal" must light up in succession.

Remember: Due to the lighting up of the Lamps "Warn ng Signal" and "Home Signal" the indicator signal 1a and 1b w ll appear at the Switchboard in the Transmitter Truck
As soon as the signal 1a and 1b appear have them verified indiv'dually from the Transmitter Truck

PREPAR NG THE V_0-TEST-DEVICE FOR LAUNCHING



Remember: In Field IV the V_0 test Receiver is still to be adjusted.
Call up the Transmitter Truck and remain in continuous phone connection
In Field IV move Test-Transformer (2) in Position T and depress.
G.ve the following order to the Transmitter Truck. "Transmit V_0-Calibrat ng Transmitter for one second"

By turning Button T in Fie d IV you will set the deflection of Pointer (1) in the yellow Zone. The position of Button T must then lie between 5 and 20

Very important You should if poss.ble arrive at this during the first transm.ss.on due to the fact that the antenna of the V_0 Ca brating Transmitter is turned on rad tion dur ng testing
The Enemy wou d be glad to know
the frequency you have used for transmitting
so that he could cause interference at launching
Conduct the test therefore with utmost speed

After Completing the Test

Report to the officer in charge that the entire cut-off ground installation is clear
The al -clear report to the Battery Commander takes p.ace at a specif c time for example, X--15 minutes, via phone

Be careful After g'ving the all clear to the launch contro. car all instruments of the Combust on Cut off Signal site must be watched over until launching

LAUNCH NG PROCEDURE

Remember The entire cut off s te operates complete y automatic that s why under norma cumstances you are not to make any adjustments

V_D Test Device

After take off of the A-4 watch the process of the VO Test Device

In F eld I S gna Lamp Take-off w go out Immed ately engage your stop-watch after approx mately 50 Seconds Signal Light Transmit" w light up due to the contact t mer n the Transmitter Truck At the same t me a r s ng sound must be heard n the Loudspeaker The Tes Dev ce n Fie d ill wi show a def ect on

n Fie d I the eft Test Dev ce w I show an ncreasing deflect on As soon as the Zone 0 2 to 0 4 mA s surpassed the S gnal L ght Reception" n F e d I must light up At the same t me the pointer of the r ght Test Device wil deflect al the way to the left and then slowly return to O aga n As soon as the Zero Pos tion has been reached the Signal Lamp Warn ng Signal" located n Field I wil light up

The Pointer of the r ght Test Device w again def ect complete y to the left in Fie d I and then s owly return to Zero Position After returning to the Zero Posit on the S gnal Lamp "Home Signa " in Fie d I will l ght up

Due to th s the combust on cut off s gnals are init ated The mpu ses have by way of the FF-Cab es engaged the c t off s gna Modulator w th transmitter n the Transm tter Truck for output and rad at on of the combustion cut-off signal

Very important Should you notice at the V_D Test Dev ce after the S gnal Light Take off has gone out and the Signal L ght Transmitter has gone on that there s no tone in the Loudspeaker and no po nter Def ect on at the Measur ng Dev ce n F e d and I then it is very probab e that e ther the V_D Ca brat ng Transm tter the Frequency Doubler or the V_D-Test Rece ver s out

You wil then by utiliz ng your stop watch manualy g ve combust on cut-off with the two push buttons in F.eld I.

Shou d there be no sound n Fie d I

MORAL Then think of the Götz von Berl.ch ngen
Take a look at your stopwatch and emp oy
Combust on cut off manually

Flying becomes stab e through steering

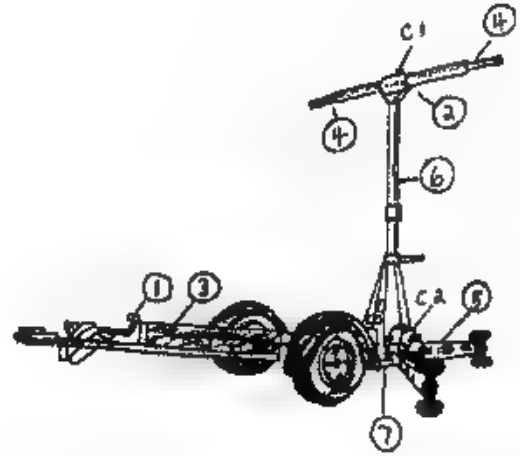
MOTTO. The guide beam leads exactly to the target

GUIDE BEAM GROUND INSTALLATION

The electric path is produced due to a Guide-Beam Device
It is called the Guidebeam Plane
It leads to the target from the Guide-Beam site by way of the Firing s te
The A-4 follows this path the way a hunting dog follows the trail of a wild animal
Be careful Erect and operate the Ground Device only if the Guide Beam is utilized for launching
After receiving the order from the Officer in Charge park your vehicle at the point designated by the Surveying Crew

ERECTION OF THE D POLE

Park the two dipoles in the designated spots
Loosen the clamps of the Mast Bracket Stand (1) from the first D pole
Place D polehead (2) on the Mast
Take the Dipolearms from the Containers (3) and fasten them to the Dipolehead

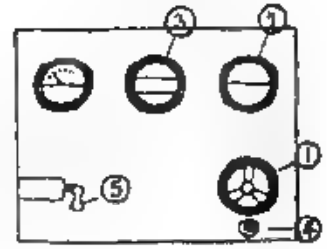


(4) Set the correct atm length You will find the specifications on the Calibration Chart
Place the Condenser C 1 according to the Calibration Chart on the correct value
(5) Unfold the legs
(6) Erect the Dipol
(7) Disconnect the Wheel frame
(8) Place the Dipol, together with the Groundspindle, in a horizontal Tai posit on For do ng this you will utilize the Clineometer

Straighten the d pole Place Condenser C 2 according to the Calibration Chart on the correct value Follow the same procedure w th the second d pole
Remember Dipoles must be placed accurately in the designated spot and be lined up in one d'rect on

LAYING THE CABLE

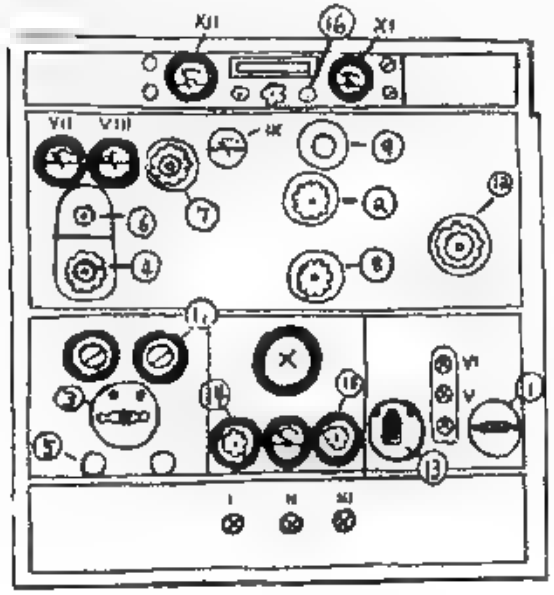
Lay out the Power Line Cable 220/380/50 Hz from the Generating Device to the Transmitter Truck Lay out the High-Frequency Cable by utilizing the Tool Carrier Truck Do not bend the Cable
Do not lay out a bend of under 1 meter in diameter
Connect the High Voltage Cable to the Transmitter and to both Dipoles



OPERATING THE GENERATING DEVICE

Engage the Generating Device
By utilizing the Handwheel (1) you will regulate the voltage at the Voltmeter (9) on 380 V

Very important Frequency meter (3) must show 50 Hz



At a Fluctuation place it on Stake (4)

Place Switch (5) to the top
Otherwise--the Transmitter Truck will get no power

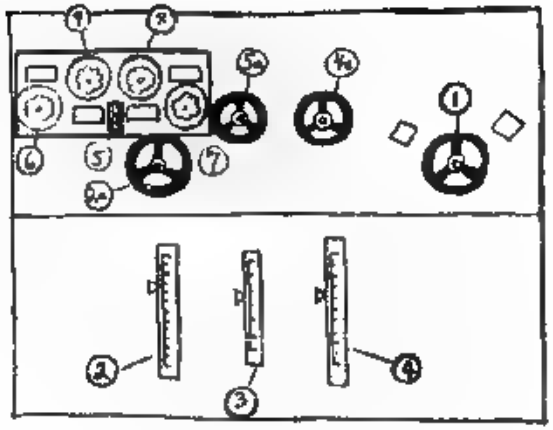
OPERATING THE TRANSMITTER TRUCK

Place the left Main Switch in the Transmitter Truck to the top
Otherwise--no light will burn and the right Switch will be without power
Place the right Main Switch inside the Transmitter Truck to the top
Otherwise--the Rectifier Part will get no power.

TUNING THE TRANSMITTERS

In order to do this you will operate switches located on the Transmitter and on the Lobe-Switching Device
On the Transmitter
Check if the Neon Lamps I, II III are lit in the rectifier
Place Switch (1) on turning by turning it to the left.
Turn Button (2) to left; by doing so you loosen antenna coupling
Turn Switch (3) to right.
Otherwise--you will not disconnect Modulation
Turn Switch (4) on the ordered Frequency.

The Lobe-Switching Device

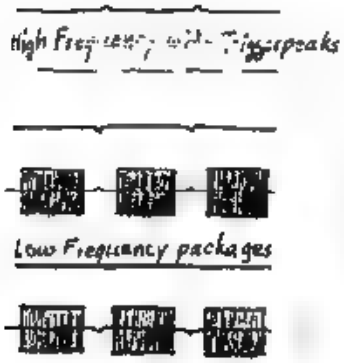


Turn Handwheel (1) on KA (mock Antenna)
Otherwise--it will be possible for the enemy to detect you
Adjust Pointer (2) with Handwheel--(2a) Pointer (3) with Handwheel (3a) according to the Calibration Chart to the correct value By utilizing the calibration chart set the control buttons (6), (7), (8), (9) properly and according to the ordered frequency.

You have hereby tuned the Lobe-Switching Condensors

The Transmitter

Depress Button (5) Neon Lamp IV must light up
Otherwise--you have no grid voltage in the tubes
After one minute depress button (5) again
Neon lamps V and VI must light up
Otherwise--the tubes have no anode voltage



Turn Button (6) until Grid Current Meter VII shows a maximum value
Turn Button (7) until Grid Current Meter VIII shows a maximum value
Turn Button (8) until Anode Current Meter IX shows a minimum value
Turn Button (16)
Otherwise--the Current Meter is not engaged
Turn Button (9) until the Current Meter shows a maximum value

At the Lobe-Switching Device

Place Switch (5) to the top The Lobe-Switch Motor will now start up

At the Transmitter

Turn Switch (1) to the right on Operation.
At the Oscillogram X you are now able to see the High Frequency with the Triggerpeak produced by the Transmitter Turn Button (3) completely to the left At the Oscillogram X you are now able to see the Low Frequency package between the Trigger-Peaks

Remember Adjust the Package Width with Button (10) and (11)
The Low-Frequency packages must be located exactly between the Triggerpeaks
Ar a small Deviation re-adjust the frequency at the Generating Set
At a large Deviation re-adjust the Synchronous Condenser at the Lobe-Switching Motor
Set the Height of the Low Frequency package at Control Button (12)

Turn Switch (13) to the left, Middle and right
The Mismatch Indicator II may not deflect over 1,3 in the above-mentioned three Positions

Remember Shou d Test Dev ce XI show a larger Deflection then look for the Error in the Lobe-Sw tch Device. Be sure the High Frequency Cable has been connected correctly

Connect with the Guide Beam Controlling Apparatus

At the Lobe-Switching Device Turn Handwhee. (1) on D pol Transm tter wi operate
Turn Sw tch (13) to the left, Middle and right Now aga n the Mismatch Indicator II may not deflect over 1 3 in the above-mentioned three Positions
Turn Switch (13) to Middle Position

At the Transmitter the Test Device XII is connected with the Guide Beam controlling Apparatus through the F F Cable It will indicate if the Guide Beam plane leads to the Target by way of the Launching Site

At the Lobe-Sw.tching Device'
Turn Handwheel (4a) unt the Po nter of the Test Device XI at the Transmitter is on Zero
Otherwise--the A-4 will not arrive at the Target
Turn Handwheel (1) on KA (Mock Antenna)
Conduct yout Test w th utmost Speed
for your transmitter is operating the enemy is listening in!

At the Transmitter
Turn Switch "Guide Beam clear" in the Transmitter Truck to the top Then in the Launch Control Car the Lamp "Guide Beam C ear" will light up

At the Lobe-Switch.ng Device
Turn Handwheel (1) (for the time being X-1) on Dipol and check the Guide Beam Position and the Mismatch

At the Transmitter
Depress (after 1 1/2Minutes) Button (17) and turn the Main Switch in the Transmitter Truck down

Otherwise--your Transmitter w.l continue to operate unnecessarily!

You must utilize speed during each Transmission.
MORAL. Otherwise you w ll help the enemy to detect you

MOTTO: At enemy jamming you are required to change your Frequency at utmost speed

CHANGE OF FREQUENCY

Years ago the beautiful woman of Venice changed their costumes several times during a Masquerade ball. This was done in order not to be recognized. When they re-entered the dance they not only wore a different Masquerade Costume but also matching Shoes, a matching Mask and a matching Hair-do

If we have reason to believe that the enemy has recognized our frequency we will change it The individual Devices must be tuned accurately when changing to a new Frequency

The A-4 is guided by two or as the case may be three Radio Communication Systems. In order to lessen the Longitudinal deflection the following Devices are utilized

the V_o-Testing System
the Combustion Cut-off Signal System

The Guide Beam System is utilized for lessening the Deflection Dispersion

The following may be changed at a Frequency Change-over
either one Radio Communication System
or two Radio Communication System
or three Radio Communication Systems

The Frequency order is the Basis for a change in frequency In this order

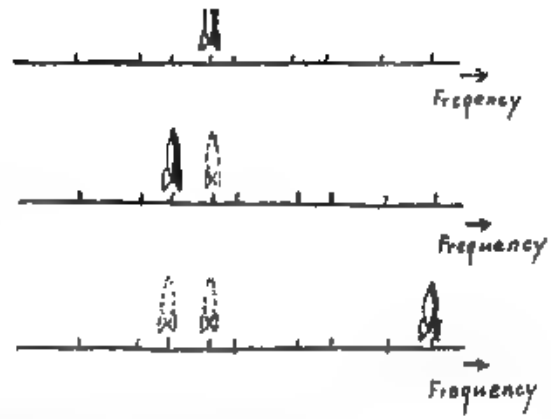
green--VO-Test System
red-----Combustion Cut-off Signal System,
yellow-Guide Beam System

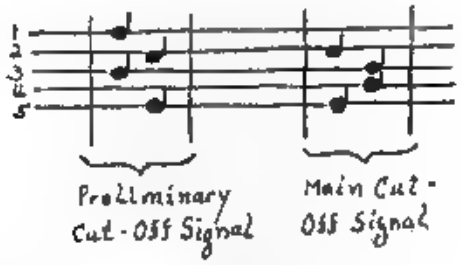
You must differentiate between

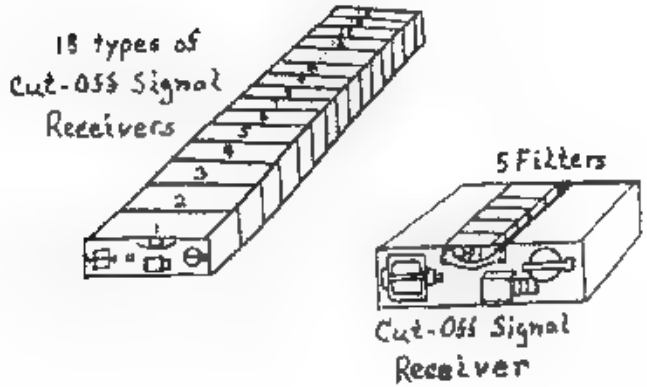
1. a High Frequency Change
2. a Low Frequency or as the case may be Audiofrequency Change

The three radio communication systems contain altogether nine Frequencies which may be util zed for Transmitting At enemy jamming one switches over to a ne.ghbor ng Frequency.

Shou d the enemy jam this Frequency also then a Frequency located at the edge of the system will be utilized.







301

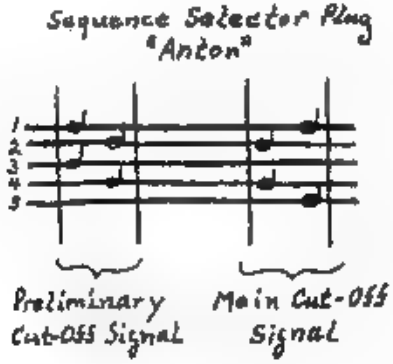
For Switching over to Frequencies

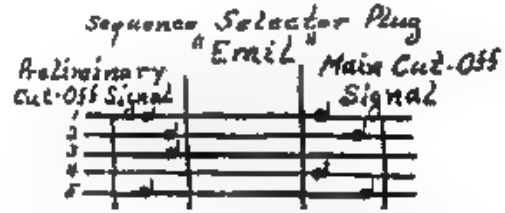
there are 20 d fferent Audio Frequencies available

The Combustion Cut-off Signal is transmitted in two Parts to the Preliminary Cut-off Signa. and the Main Cut-off Signal Each of the Signals are made up of a succession of two Double Frequencies In order to utilize these 8 Double Frequencies as operational frequencies 5 Sound Frequencies are utilized according to a certain Schema

The Sound Frequenc es are filtered n the Cut-off Signal Receiver. Five Filters are insta ed in each cut-off Signal Receiver. They are chosen from 15 available Filter proups.

In addition it is possible to change the series of the 5 Sound Frequencies of the Signals by interchanging a Multiple Plug, the "Sequence Selector Plug"





Remember: The Remote Control Site and the Launching Site receive the same Frequency Order

The instruments to be adjusted will be tested indiv.duaiy in each site.

Now Pay Attention:

What happens if you or one of your Comrades set the wrong Frequency in one of the two sites?
The Test will show however that the Instruments of both Sites are in Order

But collaboration of the various instruments will not take place Thus no combustion cut-off can be given.

Think of the Harmonica players; one is playing in C-Major. the other in G-Major. Each has pract'ced: "It's so wonderful to be a So dier". But there will never be any coordination Because they play in different Keys

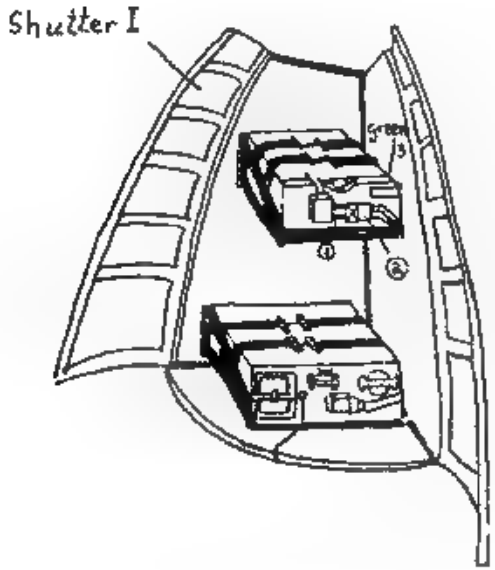
I. V_0-Test-Service

LAUNCHING SITE

Example. Old Frequency Order "green 3"
New Frequency Order "green 8"

When changing the Frequency you will work with

1. The A-4 Frequency Doub er
2. The Test Car (B-Frame). Test Transmitter



1 A 4 Device

You must interchange the frequency Doubler reachable through Shutter I of the Instrument Compartment

Unscrew the Connect ons (1) for the Door Antenna located at the Frequency Doubler and pull out the Plug (3)

Remove Frequency Doubler "green 3".

After receiving the Frequency Order engage the frequency Doubler "green 8". Connect up plugs (1) and (2) again

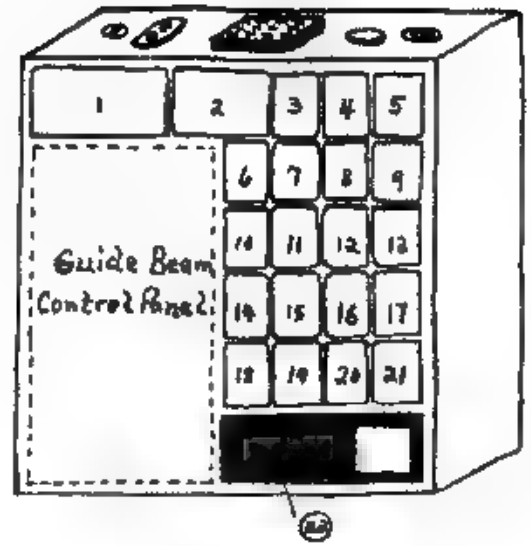
Tighten the Connection Nuts of Plug (1) for Antenna connect ons by hand only and not with a pair of pliers

2. Test Car (B-Frame)

Instead of Test Transmitter "green 3" install Test Transmitter "green 8" in Compartment 4.

You will find it in Field 14 to 21.

Now you will test the new Frequency Doubler.

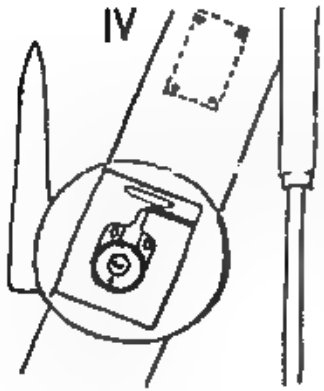


II COMBUSTION CUT-OFF SIGNAL SERVICE

Example:

Old Frequency Order: "red 6", 301; Anton

New Frequency Order: "red 4"; 301, Emil



There is a change of Carrier Frequency as well as of the 5 Sound Frequencies. Interchanging the 301 Group is hardly necessary. It would mean interchanging the entire Cut-off Signal Receiver.

When changing the Frequency you will work with:

1. A 4: Cut-off Receiver and Antenna belonging to Fin 2 and 4
2. Test Car (B-Frame). Test Transmitter, Cut-off Signal

1 A 4.

At the Cut-off Receiver reachable through Shutter 1, you are to interchange the fo. owing mechanisms or Plugs

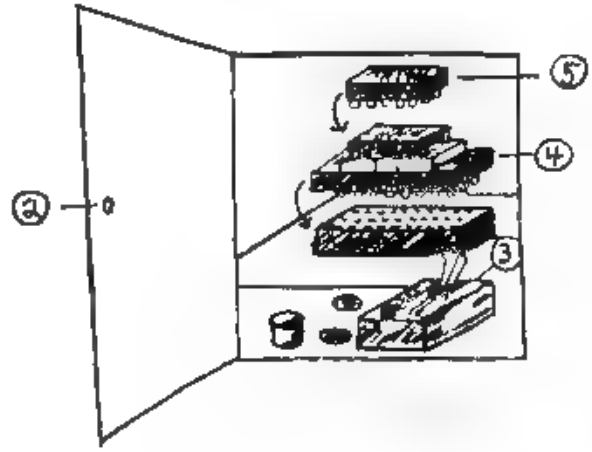
Open the left Shutter to the Cut-off S gnal Receiver
Pull out the High Frequency Plug "red 3" and after receiving the order insert Plug "red 4" and close the Shutter well
Open the right round Shutter.
Exchange the inserted Sequence p ug "Anton" for "Emil" and close the Shutter we again
Mark down the change on the Writing Tablet provided for this purpose

Beside this you are to re-set the Antenna on Fin 2 and 4.
Open the lower Antenna adjustment box.

On the Trimm ng Condenser there are 3 Plates marked with 2, 5 and 8.

For the Frequencies red 1 to 3 you will adjust Plate 2
For the frequencies red 4 to 6 you w ll adjust Plate 5
For the frequencies red 7 to 9 you will adjust P ate 8

Therefore after receiving the frequency Order "red 4" set Plate "5" on the red Marker



2 Test Car (B-Frame)

Install Test Transm tter "red 4" instead of Test Transmitter "red 6" in Compartment 3

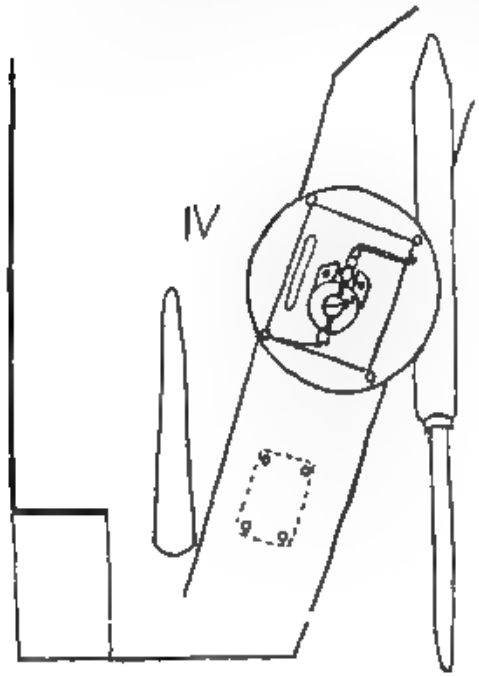
You will find it in Field 6 to 13.

Open the Shutter in Field 22 and interchange the inserted Sequence Selector Plug "Anton" for "Emil"

Now you will test the cut-off Signal Receiver as previously described.

III. GUIDE BEAM SERVICE

Example: Old Frequency Order: "yellow 3"
New Frequency Order: "yellow 4"

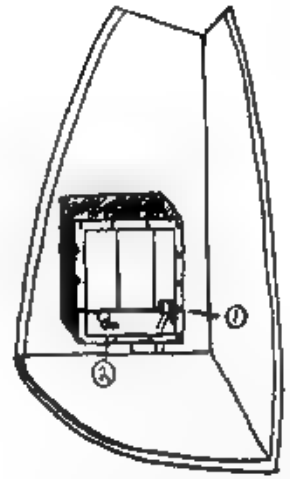


When changing the Frequency you will work on the following

1 A 4: Guide Beam Device, Aircraft Antenna.

2. Test Car (B-Frame): Model Transm tter

3 Controlling Apparatus



1. A 4:

You are required to interchange the Guide Beam Device attainable through Shutter ,V of the Instrument Compartment

Open the Insulating Case

Pull out Plug (1) and (2) and remove the Guide Beam device "yellow 3"

After receiving the Frequency Order install a Guide Beam Device "yellow 4".

Insert the Plugs (1) and (2) again

Close the Insulating Case well again

Reset the Dipole Antenna at Fin 2 and 4.
Open the upper Antenna Tuning Box. On the Trimming Condenser there are 3 Plates w th the Markings 2, 5 and 8

For the Frequency "yellow 1 to 3" adjust Plate 2

For the Frequency "yellow 4 to 6" adjust Plate 5

For the Frequency "yellow 7 to 9" adjust Plate 8

After receiving the Frequency Order "yellow 4" set Plate 5 on the yellow Marker

2 Test Car (B-Frame)

Instead of the Test Transmitter "yellow 3" install the Test transmitter "yellow 4" in the Model Transmitter You will find it in one of the fields under the Model Transmitter

Now you must test the Guide Beam Device, as previously described

3. Signal Apparatus

In the Signal Apparatus you are required to exchange the Receiver and the High Frequency Amplifier

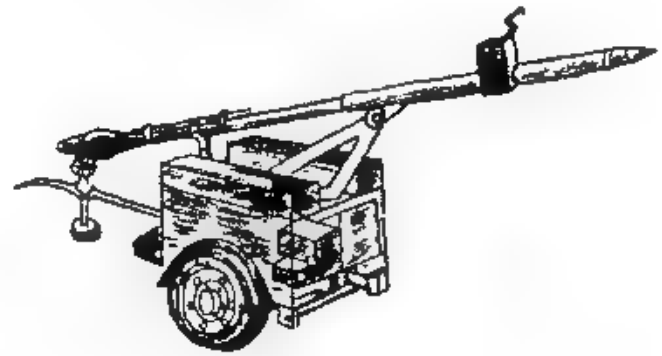
Open the left Shutter of the Trailer

Instead of the Receiver

"yellow 3 install Receiver "yellow 4",

instead of the High Voltage Amplifier "yellow 3" install the High Voltage Amplifier "yellow 4" in the Signal Apparatus.

After switching these Devices test the Signal Apparatus again



1 V_O-Test-Service

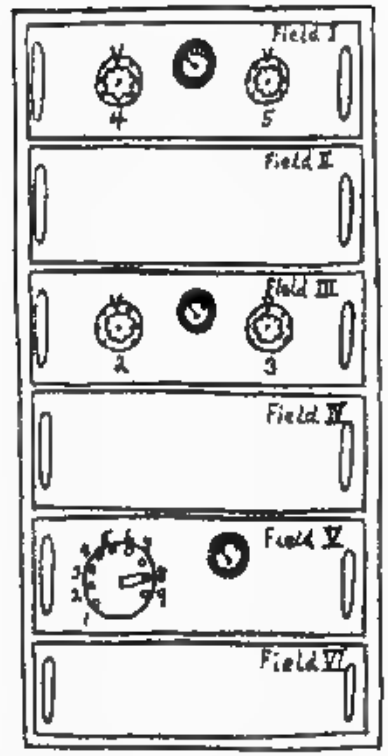
Example.: Old Frequency Order
"green 3"; ABC-425; D-1, E-2-0
New Frequency Order:
"green 8"; ABC-449, D 2, E-3-0

When changing the Frequency you will work w th

1. Transmitter Truck V_O-Test-Transmitter with normal Frequency Auxiliary Transmitter
2. Cut-off Evaluat on Truck· V_O-Test-Frame

1. The Transmitter Truck

You are to set the new Carrier Frequency "green 8" at the V_O-Test Transm tter and normal Frequency Auxiliary Transmitter



At the First Cabinet of the V_O-Test-Transmitters

In F eld V — Place the lever of the "Frequency Adjustment 1" from Position 3 to Position 8 Quarz Nr. 8 is hereby engaged

In F.e d I & III — Turn the Knob "Frequency-Adjustment 2 to 5 on Position 8

At the Output Cab net of the V_O-Test Transmitters

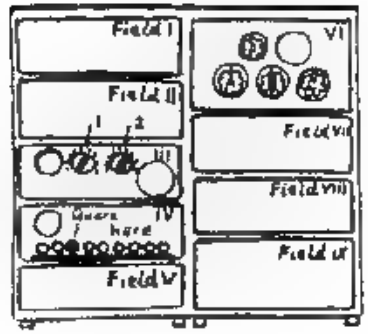
Open or shut both Lashes (1) of the two coupling Soils (2) on the Output Cabinet Just how to set the Lashes for the Frequency "green 8" is described in the plate above it After this adjustment the Transmitter must be retuned

2 Cut-off Evaluation Truck

You are to adjust the new Frequencies at the V_o-Test-Frame

Adjustment of the New Resonance Zone E 3-0.

In Field III Turn Switch 1 on Position 3
Turn Switch 2 on Position 0



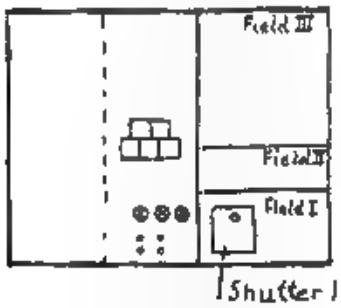
Adjustment of the New Oscillator Stage "green 8"

In Fie d IV Open the Shutter and p ace the Quarz "Po 8" n wh te-edged set of Sockets with the Descript on "Operationa Quary here"
Close the Shutter again

Adjusting the New Launching frequency ABC 449 and D 2

In Field VI Set Test Sw tch A on 400
Test Switch B on 40
Test Switch C on 9
Turn Button D on Pos.tion 2

After these Frequency Adjustments you are to conduct all tests for the V_o-Test-Frame



II. COMBUSTION CUT-OFF SIGNAL SERVICE

Example Old Frequency Order "red 6"; 301 Anton
New Frequency Order: "red 4", 301; Emi

When changing the Frequency you must work with the following

1. Transmitter Truck: Cut-off S gnal Transmitter
Cut-off Signal Modulator
Signal Control Receiver
Phantom Signal Modulator

2 Dipo antenna

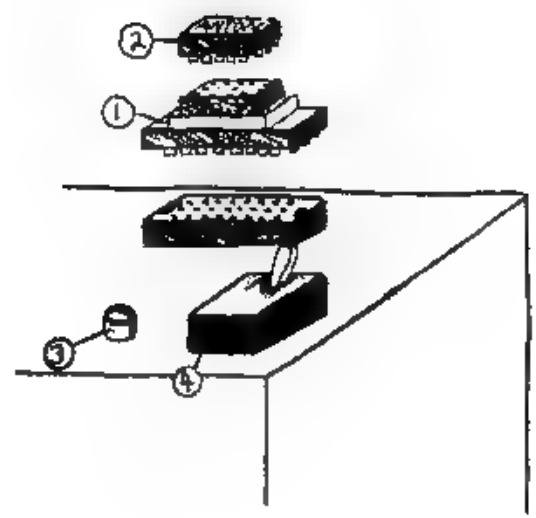
1 Transmitter Truck

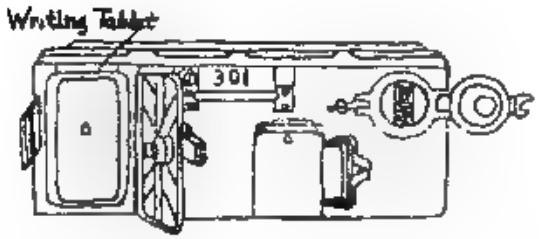
At the Cut-off Signal Transmitter you will set the new Carrier Frequency In Field I open Shutter 1

Set the Rotary Switch D 1 located behind it according to the amount of Quarz

Quarz red	Rotary Switch-Position D 1
1	A
2 or 3	B
4	C
5 or 6	D
7	E
8 or 9	F

According to the Frequency Order "red 4" Rotary Switch D 1 is set on Position "C".





At the Cut-off Signal Modulator

Instead of the Sequence Selector Plug "Anton" located at the Frequency Group Selector Plug 301 insert the Sequence Selector Plug "Emil"

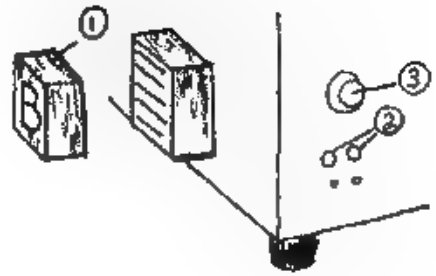
At the Signal Control Receiver

Instead of inserting Mechanism Nr 6 insert Mechanism Nr 4 into the left opening

Instead of inserting the sequence Selector Plug "Anton" insert the Sequence Selector Plug "Emil" into the right round opening.

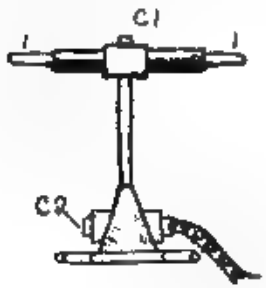
A number and a letter s marked on the Frequency Group Selector Plug which is plugged to the Cut-off Signal Modu ator, in our case for example, 301 B

If the Frequency Group Selector Plug at the Cut off Signa Modulator is changed then watch for the identificat on letter You are required to plug the Sw.tch w th the identical identification letter to the Phantom signal Modulator.



Similar to the examp.e shown concerning a Frequency Change you are not to make any changes on the Phantom Signal Modulator due to the fact that the frequency Group Selector Plug 301 B at the Cut off Signal Modulator has remained the same

You are required to set the new values at the Dipol in accordance with an available chart giving the new Frequency
For "red 4" the chart will give you the follow ng
1 = 29 C = 10 C_2 = 155



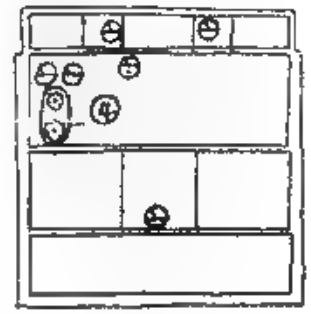
II. GUIDE BEAM SERVICE

Example Old Frequency Order. "ye ow 3"
New Frequency Order "yellow 4"

At frequency change you w l work with

1 Transm tter TrucK Transmitter Lobe-Switching Device

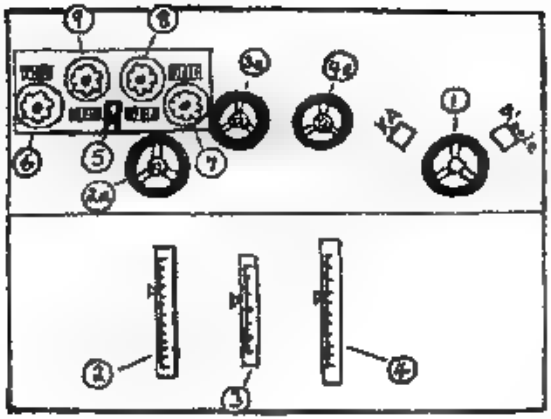
2. D poi



On the Transm.tter you are required to set the new Carrier Frequency, "yellow 4"

Turn Switch (4) from Position "3" to Pos t on "4"

Quarz "yellow 4" is hereby connected



Should instead of "yellow 1 to 4" another frequency be ordered (between "yellow 5 and 9") then you must first of all install the corresponding oscillator control crystal This is done in the following way

Unsnap the HF-Pan
Open the Thermostat
Remove one crysta and put the required crystal in its place
After that close the Thermostat put the HF-Pan back in its place and return the Transmitter

At the Lobe-Switching Device

Turn Buttons (6) (7) (8) and (9) on the cut-off co-efficiente of the ordered Frequency You will find these values on the Calibration Chart

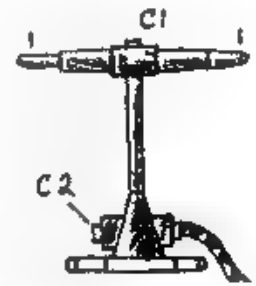
Turn Handwheel (2a) and (3a) until the Pointers are set on the cut-off co-efficients of the ordered Frequency on the Lobe-Switching Device

2. Dipole

Set the Dipole Arm Length 1, the Condensers C_1 and C_2 on the Cut-off Co-efficients of the ordered Frequency

You will find these values on the Calibration Chart attached to the Dipole

After this adjustment you are required to tune the Transmitter again



1. Signal Functioning in the Combustion Cut-off Site

Example Nr.	Type of Frequency-Change	Frequency Order: Old	Frequency Order: New	Dipol Adjustment	All Instruments in the Transmitter Truck: Cut-off Signal Transmitter	Cut-off Signal Modulator: Freq. Group Selecter Plug	Cut-off Signal Modulator: Seq. Selecter Plug	Phantom Signal Modulator Plug	Cut-off Test Receiver: Receiver	Cut-off Test Receiver: HF Mechanism	Cut-off Test Receiver: Seq. SelecterPlug
1	HF.	red "5"	red "7"	According to calculated Values for $1, C_1, C_2$	Switch D_1 en Quarz "E"	—	—	—	Do not exchange	Nr. 7	—
2	NF-Signal	red "7" 101 A Bertha	red "7" 101 A Kmarad	—	—	—	Kmarad	—	Do not exchange	—	Kenrad
3	NF.-Group	red "7" 101 A Kenrad	red "7" 306 B Kenrad	—	—	306 B	—	B	Marking 306	—	—
4	NF.- Signal and Group	red "7" 306 B Kenrad	red "7" 501 A Anten	—	—	501 A	Anten	A	Marking 501	—	Anten
5	HF.- with 2 NF.	red "7" 501 A Anten	red "4" 315 F Dera	According to calculated val. for $1, C_1$ C_2	Switch D_1 en Quarz "C"	315 F	Dera	F	Marking 315	Nr. 4	Dera

2. V_o-Test Service in the combustion cut-off site

Example Number	Type of Frequency Change	Frequency order		Transmitter Truck		Cut-off evaluation truck
		Old	New	First Cabinet	Output Cabinet	V_e-Test Frame
1	High Frequency	" ' green 6 ABC: 530 D: 7 E: 7-0	"' green 2 ABC: 502 B: 6[redacted] E: 6-0	Quartz Field V Selector Plug Frequency-Adjst: on 2 Field III Frequency Adjuster Button 2 and 3: on 2 Field I Frequency Adjuster Button 4 and 5: on 2	Rhombus Antenna Join the speels open or close	Field III: Switch "E" to the left on "6" Switch "E" right on "8" Field IV: Place Quartz Pa2 in two sockets "Operational Quartz here" Field VI: Control Button "A" on 500 Control Button "B" on 0 Control Button "C" on 2 Control Button "D" on 6

In order for you not to forget, The things you have to do,
MORAL: Quickly utilize those charts Then you will not mess up a thing.

3. COMBUSTION CUT-OFF SIGNAL at the LAUNCHING SITE

Example Nr.	Type of Frequency-Change	Frequency Order		Test Car: B-Frame			A 4: Instrument Comp. Shutter 1			
		Old	New	Test Transmitter red	Cut-off Signal Modulater		Cut-off Signal Receiver			Antenna-tuning-box
					Frequency group Selector Pl.	Sequence Selector Plug	Receiver	HF Mechan.	Sequen. Selector Plug	
1	High Frequency	red "5"	red "7"	Exchange Nr. 7 for 5	—	—	(do not exchange)	Nr. "7"	—	"g" on red mark
2	Low Freq.-Signal	red "7" 101A Bertha	red "7" 101A Konrad	—	—	Konrad	(do not exchange)	—	Konrad	—
3	Low Freq.-Group	red "7" 101A Konrad	red "7" 306B Konrad	—	306 B	—	306	—	—	—
4	Low Freq.-Signal and Group	red "7" 306 B Konrad	red "7" 501 A Anton	—	501 A	Anton	501	—	Anton	—
5	High Freq.-with two low Frequencies	red "7" 501 A Anton	red "4" 315 F Dora	Exchange Nr. 4 for 7	315 F	Dora	315	Nr. "4"	Dora	"5" on red mark

4. V_o-TEST-SERVICE at the LAUNCHING SITE

Example Nr.	Type of Frequency-Change	Frequency Order		Test Car: B-Frame	A 4: Instrument Compartment Shutter 1	
		Old	New	Test Transmitter green	Frequency Doubler	Remarks
1	High Frequency	green "6"	green "2"	Nr. 2 with 6 Interchange	Entire Device Interchange. Reinstall gr. "2"	No Deer Antenna tuning necessary

5. Guide Beam Service at the LS-Site

Example Nr.	Type of Frequency-Change	Frequency Order		Apparatus in the Transmitter Truck		Dipol-Adjustment
		Old	New	Transmitter	Lobe Switching Device	
1	High Frequency	yellow "3"	yellow "4"	Switch (4) on "4"	Adjust the Buttons (6) (7) (8) (9) and the Handwheel 2a, 3a according to chart	According to chart Values for 1, C_1, C_2

6. GUIDE BEAM SERVICE at the LAUNCHING SITE

Example Nr.	Type of Frequency-Change	Frequency Order		Test Car: B-Frame	A 4: Instrument Compartment Shutter IV		Central Site	
		Old	New	Test transmitter yellow	L.S-Device	Antenna-tuning-box	Ultra short wave Receiver	Amplifier
1	High Frequency	yellow "3"	yellow "4"	Nr. 3 for 4 Interchange	Nr. 3 for 4 Interchange	"4" on yellow mark	Nr. 3 for 4 Interchange	Nr. 3 for 4 Interchange